

REGIONAL PLANNING

PT. 7 ALASKA, ITS RESOURCES
AND DEVELOPMENT

NATIONAL RESOURCES PLANNING BOARD



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**REGIONAL PLANNING
PART VII - ALASKA
ITS RESOURCES AND DEVELOPMENT**

DECEMBER 1937

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REGIONAL PLANNING

PART VII

ALASKA—ITS RESOURCES AND DEVELOPMENT

I.—REPORT OF THE ALASKA
RESOURCES COMMITTEE

II.—STAFF REPORTS

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NATIONAL RESOURCES COMMITTEE

DECEMBER 1937

PREPARED IN ACCORDANCE WITH CONCURRENT RESOLUTION NO. 24
75TH CONGRESS, 1ST SESSION

DISCARDED

LETTER OF TRANSMITTAL

To the Congress of the United States:

In accordance with Concurrent Resolution 24, 1st session, 75th Congress, passed on August 21, 1937, requesting a report in January 1938, I am transmitting herewith a report on "Alaska—Its Resources and Development," prepared at my request as one of a series of regional planning studies by the National Resources Committee.

The report is in two parts—Part I contains a statement on policy and recommendations for planning prepared by a special Alaska Resources Committee. Part II contains a series of staff reports prepared by groups representing different Federal bureaus primarily concerned with various problems in Alaska. In order that these proposals and the supporting data may be available to the Members of Congress and to interested citizens, I recommend that the report be printed, with illustrations.

In the very limited time available for this study, a substantial beginning has been made towards "a comprehensive plan for the development of the resources of the Territory of Alaska."

FRANKLIN D. ROOSEVELT.

THE WHITE HOUSE,
January 20, 1938.

NATIONAL RESOURCES COMMITTEE

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FREDERIC A. DELANO <i>Vice Chairman</i>	HARRY H. WOODRING <i>Secretary of War</i>	HENRY A. WALLACE <i>Secretary of Agriculture</i>
DANIEL C. ROPER <i>Secretary of Commerce</i>	HARRY L. HOPKINS <i>Works Progress Administrator</i>	FRANCES PERKINS <i>Secretary of Labor</i>
	CHARLES E. MERRIAM	

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B. FRANK HEINTZLEMAN	GEORGE F. YANTIS
ROBERT W. HARTLEY, <i>Executive Secretary</i>	

This Committee was directly assisted by a research staff consisting of Vernon D. Wickizer, R. F. Bessey, James C. Rettie, Oscar Gass; and the staff of the Pacific Northwest Regional Planning Commission, Portland, Oregon

NATIONAL RESOURCES COMMITTEE

NORTH INTERIOR BUILDING

WASHINGTON

December 20, 1937.

THE PRESIDENT,
The White House.

MY DEAR MR. PRESIDENT:

In accordance with your request of August 30, and in compliance with Concurrent Resolution No. 24, requesting the preparation of "a comprehensive plan for the development of the resources of the Territory of Alaska" before January 1938, we have the honor to transmit herewith a report on "Alaska—Its Resources and Development."

The Alaska Resources Committee, which prepared this report, consists of Dr. Carl Alsberg, Director of the Giannini Foundation at the University of California and Trustee of the Institute of Pacific Relations; Paul W. Gordon, of the Division of Territories and Island Possessions, Department of the Interior and Chairman of the Federal Alaska Committee; B. Frank Heintzleman, Chairman of the Alaska Planning Council and Regional Forester of the Forest Service in Alaska; Prof. Charles McKinley, of Reed College, and Mr. George F. Yantis, Chairman of the Pacific Northwest Regional Planning Commission.

For the preparation of the report, a special Federal Alaska Committee was organized including representatives of the Federal agencies concerned with Alaskan affairs, and the subcommittees of that group are responsible for the statements in Part II of the report. Special help was provided by the Alaska Planning Council, the Pacific Northwest Regional Planning Commission, the Federal bureaus, and the National Resources Committee. Mr. Robert W. Hartley served as secretary to the committees, and Mr. Vernon Wickizer as special consultant. The limited time and funds available have required special efforts and intensive work from all who have participated in the study.

The National Resources Committee agrees in principle with the findings and recommendations stated in the accompanying report.

Sincerely yours,

HAROLD L. ICKES,
Secretary of the Interior, Chairman

HARRY H. WOODRING,
Secretary of War.

HENRY A. WALLACE,*
Secretary of Agriculture.

DANIEL C. ROPER,
Secretary of Commerce.

FRANCES PERKINS,
Secretary of Labor.

AUBREY WILLIAMS,
Acting Works Progress Administrator.

FREDERIC A. DELANO,
CHARLES E. MERRIAM.

•

HENRY S. DENNISON.
BEARDSLEY RUMEL.

*Secretary Wallace, in signing this letter of transmittal, requested that the following statement of his views be submitted therewith:

"The Committee has done an exceptionally fine piece of work in organizing and analyzing a large amount of data. It is apparent that the data available were inadequate as a basis for definite conclusion. The report emphasizes the need of further investigation and study. Considering the rather complicated situation in Alaska and the inadequacy of material, I am sure the committee has reached a wise conclusion in this respect.

"I am impressed with the committee's emphasis of caution against the over-development of Alaska. It is clear that the committee has in mind that the mistakes made in the exploitation of natural resources in the early development of our States should be avoided in Alaska. Fortunately the federal government is in control of the greater part of Alaska. An uncontrolled exploitation of the resources can be prevented. Since most of the resources are owned by the federal government there is no necessity for rapid liquidation of investment as is the case in most parts of the continental United States where resources are in private ownership. If Alaska should be regarded primarily as a great reservoir of resources available for future use, it would seem as if that balance which should be a major feature of sound planning would best be realized. In Alaska the rapid development policies dominant in the United States should be balanced by a policy of preservation. I think the report does not sufficiently emphasize this point of view."



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ALASKA

ITS RESOURCES AND DEVELOPMENT

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PART I

REPORT OF THE ALASKA RESOURCES COMMITTEE

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THE WHITE HOUSE

WASHINGTON

HYDE PARK, NEW YORK,
August 30, 1937.

Hon. HAROLD L. ICKES,
Chairman, National Resources Committee,
Washington, D. C.

MY DEAR MR. CHAIRMAN: Concurrent Resolution No. 24 passed August 21 reads as follows:

"Resolved by the House of Representatives (the Senate concurring), That the President is requested to prepare or cause to be prepared by the present departments and agencies of the Government, and within the regular appropriations of such departments and agencies heretofore made for the fiscal year 1938, and to report to the Congress within thirty days after commencement of the second session of the Seventy-fifth Congress, a comprehensive plan for the development of the resources of the Territory of Alaska, and the expansion and development of the facilities of commerce between the United States and Alaska, and within the Territory. The plan so prepared and reported to Congress, may, in the discretion of the President, embrace a statement of such works and facilities to be established in Alaska as may be desirable for national defense. Said report to contain such information as will aid the Congress in conducting investigations to determine what is to be done with the resources of Alaska."

The collection of data, the formulation of plans and the writing of the report called for by the resolution logically come within the province of the National Resources Committee and are hereby placed in its charge. The Committee may call upon any of the agencies of the Government concerned with Alaskan affairs for data, information, or other aid. The report should include as much of a national defense program for the Territory as the War and Navy Departments may determine to be in the public interest. The Committee should prepare to submit to me at least the preliminary draft of the report not later than January 1, 1938.

Sincerely yours,

(Signed) FRANKLIN D. ROOSEVELT.

FOREWORD

Concurrent Resolution No. 24, passed August 21, 1937, expresses the desire of Congress for "... a comprehensive plan for the development of the resources of the Territory of Alaska . . . said report to contain such information as will aid the Congress in conducting investigations to determine what is to be done with the resources of Alaska." Pursuant to the President's letter to Chairman Ickes on August 30 which placed upon the National Resources Committee the responsibility for preparing a report for the Resolution, an Alaska Resources Committee was appointed and its report follows.

In its study and deliberations, the Committee has had in mind three questions:

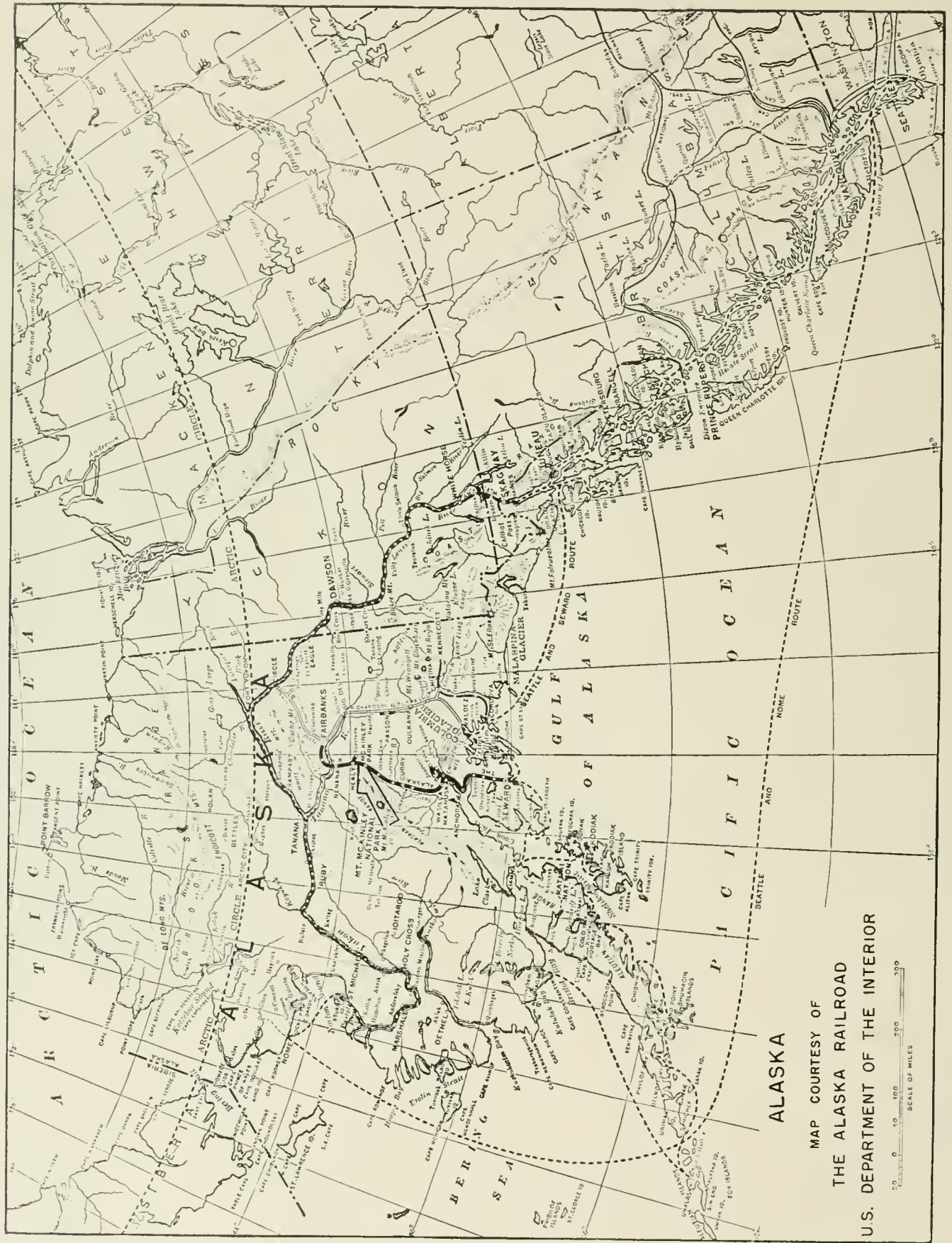
1. How has Alaska developed?
2. Is there a national need for the immediate and rapid development of Alaska?
3. How may Alaska best be developed?

The Committee's report is largely devoted to a consideration of these questions rather than to the presentation of complete and final answers to them. Unfortunately these answers cannot be given in every case, partly because some of the information on which complete and definitive answers must be based is nonexistent, partly because the time at the disposal of the Committee was insufficient to make the necessary studies. Moreover, the Committee does not believe that its responsibilities include the passing of judgment on such important questions. Rather the Committee regards its functions as limited to setting forth the more important factors bearing upon the several ques-

tions of policy raised in any consideration of Alaska's future.

Unfortunately because of the time element involved, any "comprehensive plan" is out of the question. In view of the brief period allotted for the study of this problem and the lack of funds to provide adequately for a staff and the expenses incidental to a comprehensive study requested by the Resolution, the Committee has relied heavily upon sources of information in the Federal Government. Little time or money was available for private investigation and research. The various Federal departments and independent agencies responded to the Committee's request and supplied generously their experience, personnel, and information. Without their assistance and cooperation this study would not have been possible.

Part I contains the report of the Alaska Resources Committee. It includes only such factual data as it was felt necessary to clarify the discussion. Part II consists of staff reports prepared on specially selected topics from material submitted by subcommittees representing various Federal bureaus and agencies. This factual material was compiled through the assistance of a specially organized Federal Alaska Committee composed of representatives of the 10 Federal departments and 9 independent Federal agencies. It is believed that Part II represents a fairly complete compilation of the facts on Alaska, and the various reports are reproduced as submitted to the Alaska Resources Committee, except that certain editorial corrections or revisions have been made in order to make the various reports comparable and to present a coordinated view of the situation.



ALASKA

MAP COURTESY OF
THE ALASKA RAILROAD
U.S. DEPARTMENT OF THE INTERIOR

SCALE OF MILES
0 50 100 200 300

FIGURE 1

I. THE ALASKA REGION

When Alaska was purchased from Russia little thought was given to the wealth of the land itself. Today the mineral deposits as well as the fisheries and wildlife embody present and potential wealth in natural resources hardly visualized in 1867. Already in Alaska fisheries and fur trapping have produced over a billion dollars' worth of products and Alaska mines another three-quarters of a billion—all at a relatively small cost to the Nation and a handsome return on the original \$7,200,000 investment.

However, wealth arising from the exploitation of natural resources in which the people as a whole have an interest always gives rise to problems. This is especially true of Alaska. The study of the Committee has led to the conclusion that there is no reason whatsoever to question the value of Alaska's contribution to the national economy. The Committee's concern has been to determine what lines of action, if any, are needed in addition to those already taken to enhance that value, to utilize more wisely and fully the natural resources of the Territory.

Inasmuch as the Federal Government owns most of the vast Alaska domain and since all fundamental or primary legislative power over Alaska resides in the Congress, what may or may not be done is a matter of national concern to all the people of the United States. But it is of even more immediate concern to the citizens of Alaska, who make their homes and their living in the Territory. In the last analysis, however, when and how Alaska's resources should be developed rests upon the need for these resources in the national economy.

To understand the relationship of Alaska to the national economy, the difficulties of development in the country, and to secure an appreciation of the setting of numerous problems in connection with the utilization of natural resources, it is necessary first to have some picture of Alaska today—its historical background, geography, climate, and resources.

Historical Background

Upon the early voyages of Vitus Bering, a Danish captain in the Russian Service, and of his second in command, Alexei Chirikof, during the years 1728 to 1742, Russia based her claim to the ownership of northwestern North America. Russian exploration and colonization of Alaska was encouraged by the tales which were brought back by early explorers of the wealth in furs. To Alexander Baranof, manager until 1818 of the Russian American Co., which exercised practically

absolute dominion over Alaska for 67 years, is due a large part of the success of the Russian colonies.

Russia first tried to sell Alaska to the United States in 1855 during the Crimean War, when it was feared that England would seize Russian America, as it was then known. A few years later the Western Union Telegraph Co. negotiated for the joint construction of a telegraph line from Europe to the United States by way of Bering Straits. Work was actually started in 1866, but the enterprise was never completed because of the opening of the Atlantic cable.

These activities, however, greatly influenced opinion with regard to Alaska. It was finally purchased in 1867 for about 2 cents an acre. The American public generally was ignorant of the country at the time of its purchase, referring to Alaska variously as "Seward's Folly," "Wahrussia," "American Siberia," "Zero Island," "Polaria," and "Icebergia."

Transfer of Alaska to the United States did not usher in an era of development for the country. Instead, an era of stagnation ensued. From 1867 to 1884 Alaska was almost completely neglected. The United States Army was in charge for the first decade, but its jurisdiction was withdrawn from the Territory in 1877. For 2 years thereafter there was no government of any description. Trouble arose with the Indians over the liquor traffic and local residents were forced to appeal to the British Admiral at Victoria, British Columbia, for assistance and protection when authorities in Washington ignored their pleas. Protection was later extended to Alaska and order was maintained by captains of the United States Navy until 1884, when Congress created the District of Alaska with the seat of government at Sitka, provided a system of courts, and a civil and criminal code making the laws of the State of Oregon applicable to Alaska.

After Alaska was acquired several explorations and surveys of various parts of it were made. The names of two men stand out in this work—Ivan Petrof, an agent of the Tenth Census, 1880, who spent 2 years traveling and mapping the coast and the lower Yukon and Kuskokwim Rivers and the late Dr. Alfred H. Brooks, who was first in charge of the Geological Survey's work in Alaska. So efficient, in particular, was Dr. Brooks' work that it has often been remarked that there were but two who knew the truth about Alaska's resources, namely Providence and Dr. Brooks.

The discovery of gold on the Klondike in the Canadian Yukon at the close of the nineteenth century caused the famous gold rush and stampede to the Ter-

ritory. Accounts of the governmental activities during this period vary somewhat, but it is almost certain that administration was lax; in contrast to the comparative law and order which reigned on the Canadian side, Alaska was not a secure place in which to live or work. Lawlessness was rife until the residents of the Territory, in order to put an end to the disorders, took into their own hands the administration of justice.

Communication with Alaska had always been difficult, and the influx of people caused by the gold rush created a demand for communication facilities. This was in part met by the construction in 1900 of an overland telegraph line in the Territory under the Army Signal Corps and the laying of a cable from continental United States to Alaska. Also, transportation facilities in the form of roads were provided through a Board of Road Commissioners which was created in 1905 and later through the Army Corps of Engineers.

The Organic Act passed by the Congress in 1912 abolished the District of Alaska and created the Territory. Prior to this another very important law had been passed by the Congress providing for the incorporation of towns and for the establishment of the seat of government at Juneau. Also, in 1906, Alaska was provided with representation in Congress through the election of a delegate.

Since 1900 many of the explorations of the Territory have been conducted by the Geological Survey and the United States Army, and the Army has also been responsible for operating the communication system and for providing transportation facilities in the forms of roads (until 1932) and river and harbor improvements. Today many of the major problems in Alaska are much the same as they have been ever since the period of the Russian occupation—difficulties of transportation and communication to and from the Territory and within the Territory.

Regions and Resources

Within its some 586,000 square miles, Alaska has a variety of climates, land forms, and resources. The Territory naturally divides into six major regions, each with distinctly different physical characteristics and different types of resources in various stages of development.

1. *Southeastern Alaska*.—This region comprises the narrow strip of mainland and adjacent chain of islands which extend southeasterly from the main body of the Territory along the west side of British Columbia for approximately 400 miles. It is a region of high, rugged, forested mountains rising sharply from the water's edge and dissected by an intricate network of narrow

waterways. It has mild winters and cool summers, and a heavy precipitation throughout the year. It is the most accessible section of Alaska to the continental United States and is ordinarily reached by steamer travel through the Inside Passage from Seattle.

Southeastern Alaska is the most highly developed part of the Territory with one-third of the total population and the greatest amount of industry. Five substantial towns, affording most of the social facilities deemed essential to a satisfactory modern scale of living, are located there. The local economy is based on fish, minerals, timber, recreation, and various minor resources. The salmon and halibut fisheries are very highly developed and employ the greater part of the workers, both white and native. Hard rock or lode mining, principally for gold but also for some other metals, is currently second in economic importance. The great bulk of the commercial forest resources of the Territory are found in southeastern Alaska and while they now supply only the local demand for timber products, they should eventually contribute substantially to regional prosperity as raw material for a large local pulp and paper manufacturing industry. Juneau, the capital of the Territory, and Ketchikan, its largest fishing center, are located in this region.

2. *Southcentral Alaska*.—This region includes the Prince William Sound and Cook Inlet sections of the southern coast and the adjacent large watersheds which extend inland to the crest of the Alaska Range in central Alaska. The coastal portion of the region somewhat resembles southeastern Alaska in physiography, climate, and vegetation, and similarly fishing is its chief means of community support. A number of large rivers, as well as Cook Inlet, break through the high range of mountains fronting the coast and open up inland valleys having a light forest cover, moderate precipitation, short but rather warm summers, and winter temperatures not unlike those found in the northern tier of prairie States.

The level and rolling lands which occur in these valleys afford opportunities for agriculture. The Matanuska agricultural area, in which the Federal Government recently sponsored the establishment of a farm colony, is located in one of these valleys in the vicinity of the city of Anchorage. With approximately 200 families, the Matanuska settlement of colonists and local farmers is the largest agricultural community in Alaska. Vegetables, root crops, and hay are the principal farm products. Dairying has also been started. Additional and more extensive tracts of potential farm lands, notably the Kenai Peninsula agricultural area, are found in this same general locality.

Mining is the most important source of livelihood for the region as a whole. The large Kennicott copper mines are located on Copper River. Lode and placer gold operations are conducted at various places. The large bituminous coal deposits of the Bering River and the Matanuska River valleys are undeveloped with the exception of some enterprises in the Matanuska field which supply the needs of the nearby Alaska Railroad belt.

The game resources here, as in many other parts of Alaska, attract many sportsmen from all parts of the world and thus afford considerable local revenue.

This region has the two important gateways into the interior of Alaska—the Richardson Highway leads inland from Valdez and the federally owned and operated Alaska Railroad extends from tidewater at Seward to Fairbanks. A railroad which connects with the mines on the headwaters of the Copper River drainage area leaves the tidewater at Cordova. A steamship line operating on regular schedule out of Seattle by way of southeastern Alaska serves these three ports. In addition to the service rendered to the region, all of these transportation systems provide a considerable amount of direct employment to local residents.

The population is largely centered around five towns and several large mines.

3. *Southwestern Alaska-Bristol Bay.*—This region covers the Alaska Peninsula, the Aleutian Islands, and the Bristol Bay area. It has rugged topography, wet, foggy summers, and disagreeable winters. This country lies entirely outside of the forest zone and the vegetation consists of a heavy growth of grass interspersed with patches of brush. Because of their remoteness little information is available regarding the land resources of extensive areas. The small population is largely composed of natives. Kodiak and Unalaska, both small towns, are the only permanent white settlements of any importance. Cattle and sheep grazing is being carried on in a somewhat experimental manner on a few islands, and some fur farming is also done. The Pribilof Islands, located in the vicinity, are the principal breeding grounds of the fur seal in the Pacific waters. The seal herds are given special protection by the United States Government and the pelting is a Government monopoly.

The fisheries resources are highly important and contribute a large portion of the Alaska salmon pack. The fishing industry, together with fur trapping, furnishes the principal source of livelihood to the native population. Practically all of the white fishery employees are brought from and returned to the Pacific Coast States each working season.

Commercial transportation over large portions of this region either does not exist or is available only at certain seasons and with long interval between service.

4. *Yukon-Kuskokwim.*—The watersheds of these two large rivers include the vast area termed "Interior Alaska." It is characterized by great extremes in the winter and summer temperatures and by light rainfall. A light forest growth, interspersed with grass and brush, covers most of the region but grass and tundra are the prevailing types of vegetation in the lower reaches of the river valleys near the Bering Sea.

White occupation is largely confined to the middle section of the Yukon River drainage area and has its greatest concentration in the general vicinity of Fairbanks on the Tanana River, a large tributary of the Yukon. The lower Yukon and lower Kuskokwim River areas consist of very extensive swamps and flat lands occupied almost exclusively by natives living under primitive conditions. The lower river valleys are remote with very limited transportation facilities and little contact with white civilization. The introduction of reindeer to Alaska from Siberia about 45 years ago for the use of the natives of the northwest sections of Alaska has materially improved the economic condition of the inhabitants of the Yukon-Kuskokwim lowlands.

Since the days of the gold rushes in the early years of the present century, mining, and more particularly placer gold mining, has been the principal industry in the region. For a long period simple types of operations under which men largely worked their own claims were the rule, and while this practice still continues to some extent, most of the placer gold now mined is the product of large-scale corporate enterprise and rather complex processes involving considerable capital investments. The mining of platinum has recently assumed some prominence. Coal is produced in one of the more accessible parts of the region for the operation of gold dredges and for other local uses.

Extensive areas of potential agricultural land occur in several localities and the Tanana Valley has a number of farms producing vegetables, root crops, oats, and barley for local use. Fur trapping continues to be an important source of revenue to natives and whites. The recreational features including big game are attracting an increasing number of visitors every year, and in time the recreational industry should be a very material factor in the local economy.

Fairbanks in the Tanana Valley is the principal community center. The Alaska Railroad and the Richardson Highway furnish outlets to the south coast of the Territory, and the extensive river system and a considerable mileage of gravel roads are used for trans-

portation within the region. In recent years the airplane has become a major factor in transportation throughout Alaska generally, but in the interior especially it has greatly altered previous conceptions of distance and opened up vast new areas of activity. Regular air service to Juneau is now operated from Fairbanks.

5. *Seward Peninsula*.—This is one of the more northerly areas and is characterized by long cold winters and short summers. Placer gold mining is the principal occupation of the small white population. As in interior Alaska, the one-man method of gold extraction has largely been replaced by the expensive dredge-type of operation. Nome is the principal trading center and is reached by direct steamers from Seattle during the 4 summer months, the only period when ice conditions in the Bering Sea will permit navigation.

Scheduled airplane service is maintained throughout the year between Fairbanks and Nome, thus keeping this outpost of civilization in easy and constant contact with the more populous parts of the Territory.

The large native population relies for the most part on its own primitive means for existence. The reindeer here, as in the region previously described, have greatly benefited the natives.

6. *Arctic slope*.—This remote section of the Territory appears to offer very little to attract white men. The small population is composed largely of natives and these, to a great extent, have continued their primitive cultures. Here, again, the native economy has been substantially improved as a result of the introduction of the reindeer.

The Arctic slope contains very extensive wild-fowl breeding grounds which play an important part in maintaining the wild-fowl resources over a large section of the United States.

II. SPECIAL PROBLEMS IN THE DEVELOPMENT OF ALASKA

Alaska is confronted with a great many problems of development. In the opinion of the Committee, the following are the ones which deserve early attention.

Fluctuations of Alaska Industry

In the Alaska economy, during the short summer period activities are concentrated on fishing, placer mining, and farming. To this is added the seasonal activity generated by the tourist and the sportsman. A large proportion of Alaska people thus find themselves exceedingly busy in the summer and relatively unoccupied the rest of the year, especially during the dark winter period, the only exception being the trapping of fur which furnishes employment for about 8,000 people during the winter months. Many Alaskans are confronted with the problem of earning enough in the summer months to suffice for the whole year. This is a situation fraught with many consequent difficulties.

These difficulties in the Alaska economy assume their real proportions when we recall that the most important natural resource is fish.¹ Actual salmon fishing lasts only about 2 months, but the work of preparing for and of closing operations gives considerable employment for 2 months more. Many of the canning companies send their own vessels from Seattle or San Francisco to their canneries loaded with most of the supplies, including food, needed by the workmen and the plant for the entire season. These vessels also convey most of the cannery workers, recruited in the Pacific coast cities, to the cannery and bring them back at the close of the season. Some Alaska residents, including natives, are also employed. In 1936, of 30,383 fisheries workers, 6,958 were natives.

The importing of labor for the salmon-canning industry has been necessary because of the sparse population in the vicinity of the canneries. Up to a very few years ago this imported labor was engaged for the most part in San Francisco. A contracting system was employed, and since preference was given to Mexicans, Filipinos, and Chinese, who were usually unfamiliar with the English language and the meaning of the contracts they signed, such serious abuses arose that the State of California was forced to intervene to protect the interests of these workers. Under the

N. R. A. code which was applicable to this industry, the contract-labor system was abolished. This early experience, however, is indicative of the abuses which may develop in a seasonal industry which requires the transfer of a labor force over long distances.

Mining is second in importance to fishing in the industrial activities of the Territory. It is a characteristic of mining in Alaska, especially of placer mining, that much of it occurs where the soil is so frozen that winter mining is difficult. Ways and means have been found which somewhat minimize this obstacle to all-the-year-round operations, but mining still remains highly seasonal in these areas and miners drift from the placers to the towns to spend the winter in idleness because there are no opportunities for winter employment.² Another characteristic of placer mining is that sooner or later the placer becomes exhausted as all the gold-bearing gravels are worked over. As a result, the placer community often ultimately becomes a ghost town. The miner must seek employment at some other unexhausted placer—sometimes at a great distance—or else he must enter some other form of employment, a most difficult matter because of the limited opportunities. These conditions tend to make a portion of the mining population quasi-nomadic, without permanent abode.

The seasonal factors affecting Alaska's two most important industries constitute a definite obstacle to an increased permanent population. Likewise, they are the cause of considerable wages and profits leaving the Territory, to be spent on goods or improvements in communities outside Alaska. They explain the constant drain from the Territory of capital and of people who might otherwise become permanent citizens. Such conditions tend to perpetuate the attitude that Alaska is a land for exploitation only.

Fortunately, the pulp industry envisioned for southeastern Alaska holds out another prospect, that of a year-round industry employing a quota of permanent employees while at the same time affording off-season employment to some of those now engaged in the fisheries.

Natives in Industry

The natives of Alaska have amply demonstrated their ability to participate in the major industrial ac-

¹ In 1936 the total value of fisheries products was \$50,455,272, by far the largest part of which was salmon valued at \$46,496,222. The next largest industry in Alaska is mining with a total output in 1936 valued at \$23,594,000.

² One interesting result is that the University of Alaska, at Fairbanks, has a large proportion of adults enrolled who employ their enforced winter idleness in self-improvement.

tivities of the Territory. As it is noted above in 1936, 6,958 natives found employment in the fisheries industries. Metlakahtla and Klawak have had for many years native-owned canneries. The former had a community cannery; in the latter, two privately owned plants were operated. Data are lacking, but it is known that a substantial number of natives also were engaged in the various mining and logging operations, and that a considerable part of the annual Alaska fur catch comes from trap lines operated by them. The Eskimos have shown their ability in the reindeer industry. Other industrial and commercial pursuits are not without representatives of the native groups.

It is believed that the solution to the problem of manning Alaska industries with permanent residents lies partly in the hands of the native population, and that in this solution also will be found a key to a rational policy toward them.

The situation with regard to the Alaska natives differs somewhat from that usually found when a new country is in process of development.

As a rule, in new countries the incoming population takes up agricultural pursuits and the settlers covet the land and preempt it. The indigenous people are crowded into those regions too poor to farm and bare of the resources desired by the newcomers. The natives remain poor, and lack the means of eventually raising their standards of living to an acceptable level. They are without bargaining power. Except as they may be biologically absorbed, or unless they are protected by the Government, they ultimately vanish. In Alaska, however, prospects for widespread agriculture are limited and localized. Competition for the surface domain is less severe.

The Alaska native is a human resource worthy of consideration, not only for his own sake, but also from the standpoint of the welfare of the Territory. It is not impossible that under favorable conditions the native might flourish and multiply. In such an event, the problem of seasonal industries will be lessened to that extent. At the same time, more of the wealth created by these industries will remain in the Territory.

The natives are used to the country but their standards of living are low. Their welfare and the interests of the Territory demand that their incomes should be increased in order that they may raise their standards of living. More opportunities for employment, even though such employment is only seasonal, will bring this about. Given a better income and a greater purchasing power—and given more natives—trade will increase with all of its economic and social advantages. The ultimate aim must be native economic independence.

Although keen competition for land ownership in Alaska may not exist as it did in the acquisition of continental United States, the natives have already, with only 30,000 white inhabitants in the Territory, felt the drive of the industrial advance. Because of the absence of capital, fish traps and canneries are predominantly white-owned. Even power- or hand-floating gear requires a capital outlay beyond the means of many individuals. Seasonal labor migrating from the continental United States often excludes the native from a full summer's work otherwise available to him. The reindeer industry, the only controllable land food source along the coast from the base of the Alaska Peninsula to Demarcation Point, is harassed by non-native competition. Likewise, the fur catch, limited by natural supply, tends to slip from the native's grasp. Fortunately, two enactments of Congress—one passed June 18, 1934, known as the Indian Reorganization Act, with its Alaska amendment approved May 1, 1936; and the other an act of August 1, 1937, termed the "Reindeer Act"—provide remedial measures which should be applied with all possible speed.

Native Population and Its Economy

The attainment of this projected place in the Alaska economy by Alaska natives, and their consequent well-being, are conditional upon several factors in relation to which the Federal Government must continue to play a most important part. The solving of problems of health, education, social welfare, as well as economic aids and guidance are indicated.

Because of the restriction of native activities which accompanied the reservation policy among the Indians of the continental United States, the natives of Alaska, with the exception of the transplanted colony of Metlakahtla, have steadfastly opposed the development of reservations in Alaska. This opposition was part of an insistent resistance to racial discrimination. The native in Alaska, at all points, has been subject to the competition of the technically better equipped white man whenever the native economy was of a type which promised economic advantage to the whites. For example, in southeastern Alaska the Metlakahtlans with reserved fishing rights are in a superior economic position to similar villages of Haida and Tlingit Indians which are also dependent upon fishing. In the one case the natives are protected from white competition; in the others they must compete. As a result, it is becoming evident to these southeastern Indians that some form of reserved area would be a reliable guarantee of the minimum rights essential to economic self-support.

In other parts of the Territory, where trapping represents the chief occupation and source of income, any

danger which may threaten the continued existence of the fur-bearing animals spells ruin for those thus dependent upon this occupation. It is fortunate that much of the area inhabited by the Indians and Eskimos of interior and northern Alaska is adapted primarily to wildlife and its related activities. If thorough investigation justifies the action it may be found advisable, therefore, to reserve certain areas for trapping exclusively by natives similar to the area now surrounding the village of Tetlin.

In the Eskimo country a still different problem is presented. North of the Seward Peninsula there appear to be few attractions for the white man. Aside from owning reindeer, the chief white activities are limited to trading posts, but most of these compete directly with native cooperative stores.

While there is nothing inherently bad in the presence of white traders in the native communities of Alaska, the increased emphasis on the sale of liquor to natives which has occurred since the repeal of prohibition complicates what might otherwise be a relatively simple problem. Because the Alaska native is thrown into continual contact with the white man in a variety of ways and because the sale of liquor to natives in Alaska shows no prospect of regulation, the frightfully destructive effect of liquor on these natives must be considered.

Finally the fact that a large portion of northern Alaska appears at present to be unsuited to white colonization raises the question whether it might not be desirable for the Federal Government to designate this area primarily for the use of the native population. These various considerations with regard to reserves for native use point very definitely to the need for a survey of physical resources as a guide to intelligent action of this kind.

Programs inaugurated for the economic benefit of the natives of Alaska must have as corollaries proper medical and educational services. During the period of Russian and American occupancy, the native population has probably been cut in half by recurring epidemics. In many instances this decrease has been due to diseases not usually fatal to the white population.³ Aside from these epidemics of influenza, measles, whooping cough, and, less often, typhoid fever and cerebral spinal fever, tuberculosis has constituted a rather appalling health problem. Statistics compiled by the Territorial auditor show 226 deaths reported from tuberculosis from January 1936 to January 1937. This gives a tuberculosis death rate of 753 per 100,000 among the natives of Alaska in 1936, a rate that is more

than 13 times that reported for the registration area in the continental United States for 1931.

In spite of this fact, the Office of Indian Affairs has had funds to provide only 32 beds for such cases, and these are contained in only 1 hospital, at Juneau. Although the eventual control of tuberculosis undoubtedly lies in such preventive measures as the general improvement of the Nation's social and economic conditions, the immediate situation demands additional support to the seven Government hospitals now operating, additional hospitals, the extension of community health programs, and other forms of medical assistance.

The educational program must continue to be evolved in order that it may prepare the Alaska natives for the life and industrial activities of their regions. The Office of Indian Affairs maintains some 100 day schools, centers of juvenile education, and adult activities. In addition, two vocational schools, at Wrangell in southeastern Alaska and at Eklutna in central Alaska, are operated.

A plan for administering a widespread educational system, with schools separated from one another by considerable distances, must be included in any program for the development of the human and economic resources of the Territory. Further, it is imperative that the economic advantages of credit and industrial guidance provided by the Indian Reorganization Act, heretofore mentioned, be made available as soon as possible since these aids seem ideally adapted to the needs of many native communities in the Territory. Especially is this so with respect to those natives in a position to take immediate advantage of the salmon harvests at their very doors.

The Committee is of the opinion that the application of a well-rounded health, education, social-welfare, and economic program for the natives of Alaska will not only solve the pressing problems now a part of native life, but will also benefit the Territory and the Federal Government.

Natural Resource Laws and Leases

Most of the natural resources of Alaska are owned by the United States Government. Their development is controlled and regulated generally under a policy of conservation. For many years it has been the policy not to sell the fee to forest, coal, and oil lands. Beginning with the coal lands in 1906, these lands were withdrawn from entry.⁴ A policy of leasing for de-

³It should be said that this condition is by no means unique to Alaska but one which has prevailed whenever indigenous races have been subjected to the impacts of European civilization.

⁴The precise dates are as follows: Alaska coal lands withdrawn from entry by Executive order November 12, 1906; leasing law for coal lands enacted 1913; Alaska oil lands withdrawn from entry 1910; leasing law for oil lands 1920; Tongass Forest created by Executive proclamation February 16, 1909; Chugach Forest February 22, 1909.

velopment purposes has superseded the older Continental United States policy of outright sale.

While this policy of conservation was hotly disputed when it was inaugurated, time has brought general agreement that it was basically sound. There is, therefore, no need in this report to reargue the case for a policy which is firmly established by the Congress and accepted by enlightened opinion in Alaska as elsewhere.

But there are some questions of important detail arising out of the application of the conservation program. One of these relates to the terms of the leases developed by the Federal agencies in charge of coal, oil, timber, water power, fur farm sites, and grazing lands. The leasing regulations are made pursuant to special laws which give extensive administrative discretion to the heads of the respective Federal departments.

The experience of the Canadian Provinces in administering public timberlands seems to indicate that substantial development is possible under a leasing system. There appears to be no reason why such a system may not have similar results in Alaska if it includes provisions clearly defining the rights and responsibilities of all parties, including the right of appeal by any aggrieved person either to an appropriate administrative appellate agency or, in certain cases, to the courts. Such a policy, of course, assumes that the administration of the resources will be placed in the hands of well-qualified public officials.

In the leasing of resources, the lessee is entitled to a reasonable degree of security. Some question has been raised as to whether or not present regulations with regard to leases of forest resources, fishing rights, etc., contain adequate safeguards for the lessee. We do not know how much genuine foundation there may be for this criticism. It seems to the Committee a matter of considerable importance that proper safeguards be furnished against the loss of rights by the arbitrary order of executive officials. What can be deemed arbitrary will be different in different situations, depending upon the character of the resource and the problems of conservation peculiar to it. We believe, however, that some need exists for a study of the provisions under which the leasehold resources are now offered for use.

Lands for homesteads, industrial sites, and certain other forms of occupancy, and for mining purposes exclusive of coal or oil can be patented under appropriate laws.

Information is needed concerning the proper size of the homestead unit in the Territory as a whole or in each of its several agricultural and grazing areas. Whether the maximum area to be granted each family

is to be 40, 80, 160, or 640 acres is a matter having an important bearing on the future welfare of the Territory. The existing 160-acre limit apparently does not represent the result of study or experience in Alaska, but is simply a carry-over from practice in the Western States and even there it rests upon no adequate foundation.

The Committee therefore recommends:

That the President select a special committee to review the laws and regulations relating to the leasing of resources, to homesteads, and to mining claims, in order to determine what modifications, if any, should be made to improve the application of the conservation policy in Alaska. This committee should give special attention to the problem of adjusting leasing regulations to safeguard both legitimate private rights and the public interest.

Insufficiency of Public Services

The density of population and the number of urban communities within a region are usually indices of industrial development. Based upon these criteria, Alaska is only in the first stages of such development, for in 1930 it had only 30,000 white inhabitants, and only 7 cities of 1,000 or more population. These figures attain significance when we realize they occur in a Territory to which the parent country paid little constructive attention prior to the middle 80's of the last century—a situation indicated by the fact that not a single "red school house," long a symbol of our national public pride, had been erected in the Territory. It is also evidenced by the fact that down to 1937 less than 2,500 miles of public highway had been constructed. This is a mileage equivalent to that which is regarded as necessary in continental United States to service an area approximately 36 miles square. These population developments have occurred despite the fact that an ocean journey, trans-Atlantic in time equivalent, separates the Territory from the homeland, and despite the additional handicap that historical forces have not developed in the American people a bent for overseas enterprise. Moreover, this growth has taken place despite the lack of comforts, common to Americans, to which the immigrants had been accustomed.

Within the 40 years since white migration to Alaska really began, these 30,000 persons have constructed a school system of some 100 schools, representing, in the fiscal year 1935-36, an annual expenditure of about \$643,000; a liberal arts university with a student body of 200 has been established; industries have been created which are shipping to the continental United States products with a maximum annual value of

\$76,448,062. Alaska cities, though small in size and number, have provided themselves with essential public utilities and public improvements. These facts testify to the fortitude and the initiative of those under whose immediate hands Alaska has yielded its wealth as well as to the bounty of the Territory itself.

But an increase in the population of these towns and of the rural communities depends, in part at least, upon the extension and the improvement of existing and additional cultural and social concomitants of normal living found in twentieth century America. For these cities to keep step with a changing America requires the continuing investment by communities and by the Territory in education, libraries, public utilities, transportation, communication, recreation, and other essentials of general welfare. These investments require the expenditure of public moneys which can be derived only through taxation. Any factor, therefore, which detracts from the possible income of Alaska municipalities, or the Territory itself, has direct bearing upon their ability to furnish these instruments of public need.

Metal produced in Alaska is the product of a few companies, largely owned by nonresidents. The profits are mostly expended elsewhere. Gold mines employ little labor in proportion to the value of their product and therefore contribute much less to population growth and its accompanying taxable values than other industries the products of which require greater labor costs. Gold differs from other commodities in that when it leaves the Territory it does not necessarily generate an equivalent backflow of commodities and services. If a miner strikes it rich in Alaska, and returns to continental United States to enjoy his wealth, the effect is almost the same as if the gold had been mined in the United States.

It follows that Alaska gold mining has benefited the continental United States more than it has Alaska. Since this wealth becomes the property of absentee owners, and leads to greater capital accumulation in the continental United States, instead of in the Territory, certain peculiar difficulties follow which affect the ability of the Territory and its municipalities to find the funds for furnishing the public services to which their people are entitled.

There is also the special difficulty created by the fact that 99 percent of the land within the Territory is in Federal ownership.

The financial problems thus imposed upon the Territory may be gradually eliminated in the natural course of time. In the meantime, it may be advisable for the Territory to take special measures in order to make capital available to its citizens and for the Federal Government to grant special aids in lieu of taxes

upon the property in its possession in order to enable Alaska to hold the population which is economically attached to it.

Administration of Alaska Affairs

Management of the resources of Alaska lies predominantly in the hands of the Federal Government. Whether or not there is justification for the complaints that Federal management is unwieldly and is one of the reasons why Alaska has not developed more rapidly, all men would agree that such resource management should, in so far as conditions permit, be made as effective as possible.

It has long been recognized that there is room for improvement. Fifty-two Federal agencies have something to do with the management of Alaska affairs. Often their authority and responsibility appear to be poorly defined. There is overlapping of jurisdiction and divided responsibility, resulting in confusion, delay, and excessive "red tape."

Although the Committee is not in a position to suggest a plan for the simplification of Federal administration in Alaska, it may state that any reorganization should recognize the need to plan a structure and procedure which will permit Federal representatives within the Territory to have a large amount of discretion. Alaska is so far removed from Washington and has so many unique requirements that the maximum autonomy compatible with national responsibility should be devised for the Federal forces operating there. A systematic appraisal of the administrative practices and experiences of the field establishments of the various Federal agencies is desirable.

Such an inquiry should examine the possibility of minimizing interdepartmental friction by creating a coordinating device outside the usual bureau or departmental loyalties. If over-all administrative control is to be attempted, the proper relationships between the technical bureau services performed in the Territory and the parent technical services in the continental United States must be worked out. Then there is also the problem of securing interdepartmental Federal coordination in Alaska itself.

Many of the minor conflicts and problems in the Territory today, as they have been revealed to the Committee, resolve themselves into matters of organization. For example, there appears to be a need for the consolidation of the agencies of law enforcement. Inquiry should be made into the possibilities of consolidating law enforcement personnel into a single unit recruited upon a merit basis. While it is not suggested that the Royal Canadian Mounted Police organization is a perfect model, nevertheless this sys-

tem does indicate the possibility of combining a variety of law enforcement duties under a single establishment, operating over vast sparsely populated areas with a minimum of cost and a maximum of effective results in law observance.

While the Committee has been unable to make a systematic study of the administration of justice, it feels that there are some special problems that need early inquiry. The contrast in age and sex composition of the white population in Alaska and the continental United States is very marked. The older average age and great predominance of males in the Territory are clues to basic underlying facts of social instability in that they point to the absence of normal family existence for a large portion of the white population. The Indian Reorganization Act, extended to Alaska in 1936, recognizes the need for special institutions of self-government, including minor lawmaking functions, for some of the native groups. The native cultures vary from rather full identity with the culture of the white inhabitants to cultures which retain many of their ancient ways of life. The substantive law authorized by Congress seems to give insufficient recognition to these differences.

The Governor of Alaska finds himself in a very difficult position. While Federal law charges him with "the interests of the United States with the Territory" he has little control over most of the Federal activities in Alaska, because in the main each Federal agency operating there takes its direction from its parent organization. Except for the Alaska Road Commission, the bureaus of the Department of Interior, other than the Governor's own office, are not subject to his jurisdiction. On the other hand, while granted wide powers under Territorial acts, these are so frequently shared with other locally chosen Territorial officials that the Governor cannot be validly held responsible for administering tasks created by Territorial authority. Selected by the United States Government he is yet given a veto by the Congress over Territorial legislation (even including items of appropriation bills) unless over-ridden by a two-thirds vote of the bicameral legislature. Such a power, when exercised by an

outside official without the full consent of the Territorial community, is likely to lead to friction.

The present tax system of the Territory has rightly been designed for simplicity and economical administration. The most important business license taxes are, however, jointly imposed by the Federal Government and the Territory. The division is not conducive to simplicity nor is it sufficiently flexible to permit adjustments when these are due. Evidence available to the Committee indicates that the total load of local and Territorial taxes is at present substantially lighter than the similar load borne by the taxpaying constituency of the United States. However, inasmuch as most of the tax burden of the Territory is borne by two industries occupying a somewhat special position in the economic pattern of the Territory, additional data are necessary before determining that the foregoing findings should be translated into higher taxes upon these industries. Nevertheless, the fact is sufficiently significant to suggest further careful study to determine the advisability of providing a greater proportion of the cost of government in Alaska by taxation at the source.

If Alaska is destined to remain for a long while in Territorial status, then it is desirable to reexamine carefully the Territorial pattern of government. The Territory might be given the right to determine its own structural organization, including its central administrative plan. Thus it would be able, within its own legislative sphere, to give or to withhold the veto to the chief Territorial executive as it might decide. Should it decide not to grant such power, legislation adopted by the Territory ought to be legally effective unless suspended by a specific act of Congress, or unless ruled *ultra vires* by the courts.

The Committee is convinced that administration of Alaska affairs may be simplified to the benefit of the Territory. It regrets that it does not feel itself competent to make specific suggestions at this time. Specific recommendations are justified only after a far more thorough study of the problem than the time at the disposal of the Committee has permitted. The Committee does, however, recommend that such a study be made forthwith.

III. ALASKA AND THE NATIONAL ECONOMY

Seldom is an undeveloped country developed solely as a business proposition. Usually there is some consideration of a political, social, or economic need that outweighs every other. During the past half century or more, nations have generally justified their quest for and control of overseas lands on the grounds that (1) they provide an outlet for surplus population, (2) ownership results in increased trade, or (3) control over them gives access to raw materials not otherwise available, bringing profits in time of peace and greater security in times of war. If these or similar factors are present in the Alaska problem, then it is well to be apprised of them.

Opportunities for the People of the United States

Obviously, the United States proper does not need Alaska as an outlet for a surplus population. Even now a diminishing rate of population growth has set in. Alaska therefore cannot be considered, as undeveloped countries often have been in the past, as a solution to a problem of overpopulation. Alaska is not needed as a potential means of satisfying the land hunger of the American people.

Alaska Not the Traditional Frontier

It may be suggested that with vast areas in the United States subject to drought conditions and other hazards, with substantial amounts of land of a marginal or submarginal character, and with fewer opportunities for the small operator to profit from exploitation of land resources, Alaska offers a new frontier. No doubt in a limited sense Alaska does provide some opportunity of this character, but as a solution to a problem which may exist in the continental United States, it must be dropped from consideration. Soil and climatic conditions in Alaska are such that no embracing economy can be developed principally upon an agricultural basis, and it is agriculture which is usually responsible for permanent settlement in a new country.

Whatever agricultural development occurs in Alaska will be dependent upon the extent to which mining and other industries adjacent to agricultural lands are developed. Industries based upon renewable resources such as timber, fish, and wildlife, or an industry based upon the scenic attractions of Alaska, or mining activities will be far more important in the future development of the Territory than any type of farming. In this respect Alaska cannot be considered in the same manner as many new countries where settlement

has depended to a large extent upon the pioneer's ability to live from the land.

Comparisons with Scandinavia Unsafe

The assumption is frequently made that because millions of people live happily and thrive in Scandinavian countries, which are said to have no more favorable climate and a less abundant store of natural resources, Alaska can support a similarly dense population. But the case is quite different. Not only are soil and climatic conditions different but what is of perhaps more immediate importance, the economic and social settings are so radically dissimilar that European experience would seem to have very little application to the Alaskan situation.

First, the standards of living in the Scandinavian countries are much different from those in the United States. Whether a region in which agriculture is possible is settled depends, among other things, upon the standard of living prospective settlers demand. If American farmers would be content with the standards of living of some European peasants, the prospects would be somewhat different.

Second, on the human and economic side, the Scandinavian Peninsula differs from Alaska. Scandinavia is so close to the markets of western and central Europe that part of southern Norway and southern Sweden belong to the industrial region of Europe.⁵ Alaska's nearby market is the Pacific Coast of North America with less than 10 million people. Sweden and Norway have good nearby markets in their industrialized areas. Alaska agriculture will probably develop also as nearby markets are created by future mining and industrial activities.

Already there are examples of this sort. The Matanuska and Tanana Valleys support limited agricultural activities. They are both served by the Alaska Railroad, which renders accessible a market in the mining centers of the Yukon basin and along the railroad generally. They can and will support more as the Territory develops industrially.

Third, only southeastern and parts of southwestern Alaska are at all comparable, so far as soil conditions are concerned, with Norway and Sweden. There is no permanently frozen subsoil area in Scandinavia, except on mountain tops and on part of the Kola

⁵ This includes England and southern Scotland, France, Belgium, Holland, Germany, and parts of Poland, Czechoslovakia, Austria, and northern Italy.

Peninsula.⁶ In Alaska over a large area the subsoil is frozen the year round. In the summer it may thaw out only to a depth of 3 or 4 feet. Where conditions are favorable, such frozen country may often be thawed out by removing the cover of trees, brush, and moss. Regions with drainage are especially favorable for such reclamation.

Finally, the climates of southeastern and adjacent coastal regions of Alaska are very different from those of Scandinavia. The Pacific Mountain system separates the humid, milder coastal districts from the drier colder interior. Southeastern Alaska has the heaviest precipitations, with a decrease toward the Alaska Peninsula and the Aleutian Islands. In Sweden and Norway the climate is much drier and therefore better for farming.⁷ In the interior to the east of the coastal mountain ranges, the climate becomes drier, in places too dry for farming but quite suited to grazing.

Differences in population, living conditions, proximity to markets, soils and climatic conditions in Alaska and Scandinavian countries are highly significant. It is doubtful if much of a parallel in situations between the two regions will develop for many generations. Hence, there is little justification for complicating appraisals of Alaska development possibilities by reference to such European experience.

Changed Demands of Pioneers

In the past, the empty spaces of the earth were peopled gradually over a long period of time. Immigrants were at first predominantly subsistence farmers. They expected to hew down forests, to work from dawn to dark, to do without any luxuries, to live in isolation, to do without schools, police protection, and doctors—they were ready to live at a very low level of subsistence provided they could look forward to ownership of a piece of land that in the second or third generation might yield a competence and a reasonable degree of comfort.

⁶ Only recently has any development taken place in northerly portions of the Scandinavian Peninsula, despite its proximity to well-peopled regions and a considerable store of natural resources. The arctic policy of the U. S. S. R. is dictated largely by Russia's exclusion from the warm oceans. Except for Vladivostok, Russia has no ocean port open the year round. Many of the rivers which should carry Siberia's products to market flow into the Polar Sea. It is, therefore, of the utmost importance for the U. S. S. R. to establish and keep open transport routes and bases along the northern shore of the Eurasian Continent. A political, military, and economic necessity has led to the expenditure of great sums, and the employment of some of the ablest administrators and scientists of the U. S. S. R. No doubt if the United States had comparable needs with similar proportionate expenditures, noteworthy results could be achieved in Alaska.

⁷ It must be kept in mind that even on the Scandinavian Peninsula, most of the farming and most of the population is concentrated in the southern end below a line drawn west from the Aland Islands. What is found north of this line is relatively unimportant. The settlements that exist in these northern regions are founded on silviculture, fishing, mining, or hydroelectric developments.

Migrants of this type are becoming fewer and fewer in the world, and it is doubtful if the United States has even its proportionate share. Nor is it necessary that settlers live on a subsistence level in the development of Alaska. Were the Territory a different type of country, with more outstanding agricultural possibilities, this would, however, be one way in which people would be attracted to it, and people as well as capital are necessary in the utilization of natural resources.

The cold forest zone, or taiga (to the south of the tundra zone) generally offers little prospect for settlement. Much of Alaska is this type of country. Nowhere in the past have such regions supported a dense population. If occupied at all, they support a few people who subsist on fish and wild game, sometimes on the milk and meat of reindeer. This type of land means more to man for timber, minerals, and grazing than for agriculture. Such agriculture as develops, other than subsistence farming on a very low standard of living, is oriented toward mining centers which furnish a market. In Alaska there is already some such farming to supply local demand. It is a healthy development, and no doubt there will be more of it.

But the settling of emigrants as subsistence farmers, even though feasible in Alaska, would be of doubtful value from the standpoint of the Nation as a whole. The subsistence farmer produces no surplus beyond his own bare needs, he has little or nothing to sell; hence he can buy little or nothing. He does not generate trade. In a thinly-peopled region subsistence farmers may, indeed, be a liability. They require relatively large governmental expenditures for roads, post offices, schools, and police protection, but contribute little revenue in the form of taxes.

The economics of pioneering used to be simple; it was embodied in the expression "cheap lands." Capital requirements were small, low standards of living were accepted, and government was a logical ultimate result of the early pioneer's labor. There was a wide spread between production costs and market price, so that the chief problem was one of getting the product to market. Today, capital requirements are much greater. Consideration is given to markets and capital values. The modern pioneer thinks in terms of government and what it will do for him. If settlement is not made easy for him, the present-day pioneer will seek more sheltered spaces or call upon his government to discharge its social responsibility toward him.

Possible Trade and Commercial Advantages

Even though there be no immediate need to develop Alaska as an outlet for population, as a sort of new frontier, there are other considerations which may

render it in the "national interest" to speed up the development of Alaska. Among the most important of these is economic advantage. This is often the motive that leads a country to direct its energies toward the development of an undeveloped country.

Present Uneven Commerce

Present-day trade with Alaska, in terms of dollars, is quite largely a one-way affair. Alaska sends to the continental United States products of the fisheries and mines as well as furs, and imports supplies and foodstuffs. These imports can never balance the value of the exports so long as there are only 60,000 people in the whole Territory, including natives. The balance of merchandise trade is favorable to Alaska, unfavorable to the continental United States.⁸ Were Alaska foreign soil, this state of affairs might cause alarm in some imperfectly informed quarters.

However, Alaska is not a foreign country and its products for the most part do not compete with those of the continental United States. Salmon, to be sure, may be regarded as indirectly competitive with other sea foods; but a substantial part of the salmon canned in Alaska is exported and represents a by no means unimportant item in American export trade. Copper is directly competitive. Furs are not and neither is gold. The balance of merchandise trade unfavorable to the continental United States statistically is in fact highly advantageous because of the manner in which the fisheries are organized and because of the nature of the commodities sent to the continental United States, especially gold.

For all practical purposes Alaska is at present a terminus—not a transshipping point and not a considerable market for manufactured products. In order for more foodstuffs and manufactured goods to be sold to Alaska, a substantial population growth must take place in the Territory, but this awaits the development of the country. It may be good business to develop the country artificially, but this is not proof that there is a need to do so.

Trade Potentialities of Alaska

Though continental United States may be the logical market for Alaska's products, trade, of course, does not have to be solely a two-way exchange. It may be three-or-more-cornered. It is frequently pointed out that Alaska enjoys remarkable strategic advantages from a trade standpoint by virtue of its location on the great circle course to the Orient. This is quite

correct. The question then is: Are there potentialities for an export trade from Alaska to the Orient?

In fisheries, the most important industry today in Alaska, the opportunities are obviously limited. The competition is Japanese, and, due to the differences in production costs, particularly those of labor, there would be small prospect of developing any substantial commerce to Alaska's nearest market outside the United States and Canada.

Mining also suggests some limited prospects for this type of development, since the chief product of Alaska mines today is gold. However, gold under the conditions that obtain in Alaska, would not necessarily generate a backflow of goods in exchange, and therefore gold might not be usable as one corner of a triangular trade. Sometime in the future coal, oil, and copper might become the basis for such trade.

Fur trapping, which is the third largest industry in Alaska today, holds some limited prospects for such a type of development.

Due to the relative disadvantages previously suggested, it cannot now be foreseen how any type of specialized agriculture could be developed which would permit participation in the export markets, especially those of the Orient.

Possibly products of the forests some day may provide an opportunity for export trade as these assets become better known and better developed. Competition in markets of the Orient at present comes not only from other Far Eastern countries but from the Pacific Northwest of the United States, already well organized and possessing ample reserves. If and when a newsprint industry develops in Alaska, a portion of its foreign market will doubtless be found in the Orient, though, as yet, this may be regarded only as a speculative possibility. That Alaska's forest resources are well adapted to a pulpwood or newsprint industry is indicated in Part II of this report.

There is, however, another consideration bearing upon international trade which has to do with Canada, the best customer of the United States. If a pulpwood or newsprint industry is developed in Alaska, some competition with Canadian exports to the United States will inevitably result. This would create certain problems, varying with the magnitude of the competition, in the field of international trade control.

Needs Not Imperative

The conclusion is inescapable that, from the standpoint of trade and commercial considerations, the "national interest" is not now and, under the circumstances, cannot soon become of such nature as to present imperative reasons for the more rapid development of Alaska on these special grounds. But there is still the matter of access to raw materials and resources.

⁸ It is highly improbable that if it were possible to get data on other items (tourist expenditures, investments in Alaska, services such as Government expenditures in Alaska, and similar items) the balance of payments would be tipped in the other direction.

In time of peace this presents no problem to the United States, it being perhaps more richly endowed in this respect than any other nation.

There are a few exceptions, however, in the case of minerals which have a special importance in time of war, and this brings up political aspects of the problem of Alaska development. Solely as a means of advantageously completing its economy in times of peace, the United States has no real need for raw materials that Alaska resources may be able to provide, although if such raw materials can be produced in competition with world supplies without governmental subsidy, this may be economically desirable.

Political Considerations in the National Welfare

With the exception of the matter of protecting the Alaska fisheries from foreign exploitation, which is referred to in a later section, no special problems involving political considerations have come to the Committee's attention other than that which relates to deficiency raw materials and possible national defense needs.

Deficiency Raw Materials

Though the United States may not need access to certain raw materials of Alaska for the fullest development of its domestic economy, added security in time of war is often a sufficient motive to lead one country to develop another land overseas.

There are deficiencies in our domestic supplies of antimony, chromite, manganese, nickel, and tin, to name those wherein the deficiency is greatest.⁹

Some of the minerals in which supplies are deficient have a special "strategic" importance in that they are essential to steel making and similar pursuits of special importance in time of war. Considerations of national defense are, therefore, involved. While it is not definitely known precisely what part Alaska might play as a source of these raw materials when they are needed, the larger problem is nevertheless raised as to the soundness of the premise that control over such sources of supply is vital to national defense.

The argument usually runs something as follows: Such minerals are of special significance in any program of national defense. No adequate supplies have yet been found in the continental United States. Times of stress do not permit bringing such deposits as exist into successful production. Therefore the Federal Government should proceed now with exploration and development with the implied, if not expressed, objective of making the United States completely self-suffi-

cient. Some examination and appraisal of this argument should contribute toward a clarification of a confused subject.

National Defense Needs

In the experience of other countries, notably Great Britain, Japan, Germany, and Italy, control over distant possessions has given no substantial advantage in access to raw materials in time of peace.¹⁰ In time of war access to essential raw materials has depended entirely upon control over lines of communication with those sources.

Because of the prohibitive costs involved, purely local defense forces are mobilized only in time of war. In time of peace the United States Fleet is relied upon for the general defense of our territory and delays the creation of purely local defense forces until mobilization. Upon this fleet in time of war rests the control or lack of control over lines of communication, which means shipping. Without such control all the strategic resources in the outside world are rendered useless.

If it be granted that control over lines of communication is the deciding factor insofar as greater security in time of war is concerned, then one clue is provided for the development of a sound national policy with regard to Alaska. Peace or war, the advancement of adequate communication with and within Alaska would seem to be a responsibility of the Federal Government.

It must also be borne in mind that opportunities for substitution do exist and will present themselves when the occasion demands it. The problem with regard to deficiency raw materials resolves itself into a question of whether it is cheaper to buy these on the open market and pay the necessary price, with the idea of building up reserves within the areas of prospective use, or to try to find them in Alaska, and then mining and transporting them, if found, to "accessible" places.

The National Interest

It may be contended that the latter procedure is preferable, regardless of cost, because it would be desirable to encourage Alaska development anyway. This, however, is a premature assumption. If sufficient demand exists for the minerals in question, ways and means will be found for discovering and mining them or for finding substitutes. But if it may be conceded that there is some "national interest" involved here—although the extent of it cannot now be appraised—that interest is confined to a type of mining activity which is limited in scope in that the labor it

⁹ National Resources Board Report, Dec. 1, 1934, Part IV.

¹⁰ Clark, Grover, *The Balance Sheets of Imperialism*, Columbia University Press, 1926.

will employ and the potential production involved probably is not large.

In any event, it would seem to be the part of wisdom to speed up the geological exploration of the mineral resources of the Territory and to map them with the greatest speed, in order that it may be learned whether or not Alaska possesses any considerable store of strategic minerals in addition to those already known.

An appraisal of national interests indicates that there is no clear need to speed up the development of Alaska. There is no population or economic pressure necessitating such a course. Precisely what the national interest in Alaska mineral deposits from the standpoint of national defense may be is something

which is unknown now but which should be determined at an early date. The Committee therefore recommends:

That studies be made (including extensive geological surveying and general mapping) to determine the extent of the nation's special interest in the development of sources of supply within the Territory of Alaska of certain metals or minerals, an adequate supply of which may be important in the maintenance of national security.

While analysis fails to reveal a present imperative need to develop Alaska more rapidly for any specific national purpose, this is far from demonstrating that more rapid development may not take place even under present conditions.

IV. DISCUSSION OF DEVELOPMENT POLICIES

Most economic existence in Alaska today is directly dependent upon the utilization of raw resources. Economic activities in Alaska have been influenced by a conscious national policy of conservation which has been in operation for some years. The pattern of conservation policies is primarily that of a sustained yield from resources which are expendable or exhaustible through unrestricted use but which, with care and good management, need never be destroyed. By far the greater number of Alaska's natural resources fall into this category, the fisheries, wild life, and forests being among the more important.

Conservation naturally tends to slow the rate of exploitation of a new country. In the past there has been a feeling on the part of Alaskans that the Federal Government's policy in the Territory tended to lock up unnecessarily the natural resources. While available information indicates that Alaska has real developmental possibilities, it is not a "vast storehouse of easily attainable wealth awaiting only the opening of the door." What the Alaska of tomorrow may be depends upon the policies and their interpretations which may be followed in the future.

It is the part of wisdom to develop Alaska so that the present generation may derive as great benefits from it as may be consistent with safeguarding the interests of posterity. This means that Alaska should be opened up as fast as and no faster than economic conditions warrant; those industries should be developed that are able to face normal competition; and natural resources should be utilized as fast as and no faster than will, in the long run, be in the general interest not of Alaska alone but of the whole Nation.

Consequences of Different Development Policies

The Congress has asked for information that will assist it in determining, "What is to be done with the resources of Alaska?" Broadly interpreted, this question means: "How may the resources of Alaska be developed at the same time they are conserved and kept free from monopolization?" Perhaps no one is in a position to say precisely how this desirable end should be achieved. Sometimes a service is performed in pointing out how not to do a thing. At least the probable consequences of pursuing different courses of policy should be thoroughly understood if an adequate and sound policy is to emerge.

In general, the pattern of policy toward Alaska has been set, based upon conservation considerations. Ob-

viously, there is a wide range of interpretation and unquestionably from time to time modifications in the application of this policy will be desirable due to changed conditions. Whether such modifications are wisely made will depend upon more than a mere adherence to the principle of conservation. In the range of development policies applicable to Alaska there are two extremes which, if followed, would logically result in two quite different Alaskas in the future.

One extreme is an Alaska serving solely as a source of raw materials for the United States. Such an Alaska is undoubtedly possible. It is capable of making considerable contributions to the welfare of the people of the United States as long as the resources last. It would be a "boom" Alaska developed as a result of a policy of frank exploitation. Such a policy must look to the accumulation within the Territory of a sufficient labor supply to make exploitation possible. Accumulation of capital within the Territory is not essential. Capital is important only insofar as it is required to pay wages and furnish equipment, to attract workers, to create opportunities for them to gain a livelihood, and to accumulate a class of wage earners upon which industry may draw. The necessary capital for these purposes would in the main come from the outside.

After the boom, this Alaska would probably be thinly populated. Many of its people would depend upon what remained of depleted mineral resources. Ghost towns would dot the country. A little local industry and some agriculture would be scattered here and there. All the governmental services would be demanded just as in boom days. The ownership of the mines and other resources would be largely in the hands of a few large corporations. Little local capital would be available. Most of the resources would have been exported for the benefit of absentee owners.

At the other extreme would be a future Alaska with its own well-rounded economy. Whether this Alaska is possible is by no means certain. Assuming that Alaska is capable of ultimately developing its own reasonably independent economic life, then gradual accumulation of capital must take place within the Territory itself.

A policy shaped toward this end would aim at the ultimate attainment of a considerable degree of financial independence for Alaska. It would be directed toward an Alaska with a course of development analogous to that of the United States, Australia, South Africa, and other countries which were but thinly populated by natives before they were settled by white men.

Such countries first borrow capital from the outside and pay for the servicing of their debts with exports of raw materials. At the same time, they begin to accumulate capital by saving, so that they need to borrow less and less as time goes on. Ultimately they may even retire all or most of their foreign debt, a position achieved by the economy of the United States only after the turn of the twentieth century.

If Alaska were to develop in this way it must gradually save and accumulate capital. In planning for this end, one must examine every industry and every human activity in the Territory to determine whether it tends to cause capital to accumulate in Alaska, whether it is of little effect in this respect, or whether it does, or will, deplete Alaska of capital. One may use this criterion to determine whether in a given case an industry, say the fisheries, lumbering, or mining, is causing capital to accumulate in Alaska and thereby furthering the development of Alaska in the direction of an economic life not dictated by absentee capitalists.

These, then, are the two extreme types of development for Alaska: (1) to make it a source of raw materials for the United States, and (2) to give it as independent and well-rounded an economy as the physical condition there will permit. In the end, after a century or two, a brief period in the life of a nation, the two types of development would present very different aspects.

Of course, it is not anticipated that the United States will completely abandon conservation policies and thereby tend to realize the first type of development. Not only is the spirit of the times different, but the manner of settlement in Alaska is and will be different from that of the West, for example. Nor is it probable that at the other end of the scale the world will ever see an Alaska of the second type pictured, for the Territory is subject to as many and perhaps more handicaps than have been involved in the settlement of other pioneer regions.

Determination of Future Policy

The type of policy that would result in the first kind of a future Alaska would develop the Territory in the interest of continental United States, that of the Territory being only a secondary consideration. This would be defensible on the ground that the resources, such as gold mines, are no more the heritage of the Territory in which they happen to be found than they are of the States and of the Nation and that users of these resources in the continental United States should not be required to pay tribute to the Territory where they naturally occur. In answer to the argument based on diminishing value and the disappearance from the Territory of its natural wealth, it may be urged that

a part of the resource at least is converted into other taxable forms of wealth, which continue to be a taxable asset of the country.¹¹ But in the case of bonanza gold mines, that portion of the resource which continues to be a taxable asset of the Territory may be a very minute portion indeed of the natural resource removed.

If ever this course were pursued by the Federal Government in Alaska it would discourage the mining of gold by any person who did not proceed to enjoy or "consume" his new wealth in the United States. The policy would be to speed up the exportation of Alaska's natural resources so far as would maximize the returns over a period of years, not too long.¹² It might be profitable for the people of the United States to spend upon the Territory sums greatly out of proportion to the number of people in Alaska or likely to be drawn there as the consequence of such spending.

Very much the same sort of Alaska might emerge if all regulation were abolished and the Federal Government did nothing more than maintain peace and order. There would, however, be immeasurably more waste with correspondingly less benefit to the people as a whole.

The second policy, directed toward the development of a better rounded economy for Alaska, is defensible on the ground that the first policy will leave a gutted land some generations hence which will support few people, be of little benefit to continental United States, and possibly even be a source of weakness and considerable net expense. A slower, more permanent development may be justified on the ground that the rapid exportation of a natural resource, such as gold, very often creates but little in the form of taxable assets in the Territory and accrues preponderantly to the benefit of the people of continental United States.

Since such export generates but a trickle of goods and immigrants back into the Territory, Alaska has a claim to consideration at the hands of the Congress quite different from that of any other State, possession, or dependency.¹³ The export of gold from Alaska is largely pure gain to the United States; an only slight return payment in goods and services has to be made. The gold creates taxable assets in continental United States which contribute to the wealth of the people.

¹¹ Cf. F. R. Fairchild and Associates, "Forest Taxation in the United States," p. 417. U. S. Department of Agriculture, Miscellaneous Publication No. 208. October 1935.

¹² In the case of gold mining such speeding up could take many forms—taxation discrimination, rapid geological surveying to facilitate prospecting, mapping, road building designed to open up gold-yielding regions with little expense to mine owners and prospectors, and general improvement of transportation and communication facilities.

¹³ Except, of course, to some extent other gold-producing regions of the United States.

The returned mine owner who has "struck it rich" spends at least the income of his new wealth in purchasing goods and services which give employment to labor and speed up the wheels of industry.¹⁴ The Federal Government enlarges its revenues through the income tax and other forms of taxation. Alaska has then on the score of its gold production—and also of its fisheries—a moral if not a legal claim to substantial contributions from the Federal Treasury.

Contributions from the Federal Treasury might, however, be justified on other grounds. It should, perhaps, be a matter of national pride to develop Alaska into a strong commonwealth with an economy so nearly self-sufficient that it could stand on its own feet on a high plane of living. In that event the Federal Government would pour large amounts of capital directly and indirectly into Alaska so as to speed up development and subsidize many sorts of industry indirectly on the theory that after a number of years there would be so many people in Alaska and so many strong industrial undertakings that further Federal support would be forever unnecessary. This is a version of the infant industry argument and is subject to the same objections. The cost would probably be enormous and the outcome is so doubtful that this variant of the second type of development for Alaska need not be further considered.

¹⁴ Such effects were actually demonstrable in Canada. Real-estate and building booms were generated in Toronto and other cities of eastern Canada. The value of gold mining as a cushion in a depression has also been demonstrated in Canada. Gold mining is unique among all industries in that it booms during depressions, a characteristic that gives it a special value as a damper on the swings of the business cycle. To Canada, whose economy is so largely built on the export of wheat, gold mining was a lifesaver during the depression.

It is not the function of this Committee to say what type of general policy should be pursued by the Congress; that is a matter of political wisdom. The Committee will consider that it has discharged its responsibilities by setting forth the alternatives and analyzing their consequences, however imperfectly.

The two types of development are not mutually exclusive: the first type must, from its very nature, result in some settlement, though perhaps not all permanent; the second must furnish a substantial quantity of raw materials to the United States but over a longer period of time. No doubt the policy that will be followed will be somewhere between the two extremes illustrated here; but if a sound plan is ever to be adopted, the very great difference between the two types of development must be kept clearly in mind.

No policy of forced development for Alaska appears necessary. No economic emergency exists with respect to the present residents of the Territory. Whatever may be the deviations to right or left of the present policy toward one or the other extreme, the objective of an orderly and steady growth along such lines as may be indicated should be kept in mind.

The United States has had considerable experience with settlement and development of new country, but the Alaska case is in many ways quite different. Here renewable and nonwasting resources in the form of fish, timber, fur, game, and scenery will most likely assume the role usually played by agriculture in providing a foundation for a stable and permanent economy. But all of the experience of the past may be profitably used in wise planning for development of a territory in which mistakes already made do not complicate the task.

V. SUGGESTIONS FOR PLANNING

Regardless of what may or may not be done by the National Government toward the development of Alaska, it is obvious that it must have some sort of inventory of what it has to operate with or upon.

Need for Comprehensive Surveys and Investigations

Less than half the Territory has been mapped. Since mapping in the usual way is slow and very expensive, the first step should be the initiation of a program of aerial mapping of the Territory starting with the localities in which the need is determined to be greatest. In addition to furnishing good information on the topography, aerial maps afford a rapid means of obtaining good data on the distribution of vegetative cover which is of great practical value to the prospector, engineer, farmer, wildlife specialist, and forester. They have been of immense service in Canada for mine exploration. Aerial mapping should be followed by ordinary mapping as rapidly as funds can be made available.

There is need for a great deal more scientific research on Alaska questions. A Forest and Range Experiment Station needs to be established; it has already been authorized. Fur farming methods need to be improved. Wildlife needs to be investigated. Better ways and means for insect and mosquito control need to be discovered. All sorts of Alaska materials need to be tested, and also analyzed chemically. The need for more research on the fisheries is indicated. Most of this research is either planned or in progress in the several Federal scientific agencies. There is likely to remain, however, an important residuum which does not fit into the operations of any existing agency. Special provision needs to be made for it at some university or research institution.

Purely as a matter of good business, the Government should hasten the process of discovering the precise nature of its assets. No really valid appraisals of potentialities can be made without far more facts about the resources of Alaska than are now available.

The Committee, therefore, recommends:

That the mapping program of the Territory be speeded; that more comprehensive inventories of land and its potential uses be provided; that adequate studies be made of the forest and wild life resources and problems; and that a general inventory of the water resources and their possible utilization be completed.

Transportation and communication, their relationship with trade development and other facts, will become significant as facts accumulate upon the land and water resources of the Territory, indicating what may profitably be done with them. Under present circumstances, a real basis for broad consideration of the Territory's economic problems is lacking.

Basis for Planning

Since the several geographic regions and subregions of Alaska differ so much from one another, it is obvious that they must run different courses of development. Any plan for the development of Alaska must therefore consist of a basic general plan upon which are superimposed detailed plans, one for each region, consistent with the general basic plan but differing from one another in details. After all, Alaska has about the same area as the States lying east of the Mississippi and north of Tennessee and North Carolina. One would not propose a single uniform plan for all these States together.

The immediate problem in the development of Alaska resources is the discovery of such lines of action as will utilize, perhaps only for the benefit of the people of Alaska, such resource wealth as is now known to exist. Areas already inhabited and in some stage of development provide that opportunity. But even in these cases, plans cannot be conceived upon as sound a basis as would be possible were there adequate knowledge of resource conditions generally in the Territory.

Fundamental to any and all action is a knowledge of the areas, distribution, and amounts of land suitable for lumbering activities, forage, agriculture, mining, game, fishing, water-power development, and recreational pursuits. Federal and Territorial funds cannot be properly and economically expended in development work until an adequate classification of the land has been made.

Until the needed surveys and studies previously mentioned have been made, it is probably advisable to concentrate short-term programs on the further development of southeastern Alaska and the Alaska Railroad belt. Southeastern Alaska is already the most highly developed part of Alaska industrially and contains about one-third of the total population. These regions are the most compact, have the greatest diversity of industry, and most of the population. Hence, they are the logical places for immediate activities pending the formulation of a general program for Alaska.

Integrated Planning of Development Areas

The great cost and other difficulties involved in providing adequate public social facilities for numerous remote families and communities over a country of almost 600,000 square miles indicate that serious efforts should be made by governmental agencies to avert a haphazard growth. Much might be accomplished by encouraging the development of unit subregions or localities which are shown by investigation to afford opportunity for well-rounded resource use and fairly compact settlement. By the exercise of some forethought it should be possible to maintain good standards of living, eliminate pioneering on a bare existence level, and reduce to a minimum the chance for the decadence of frontier community centers into "ghost towns."

A program of investigation and integrated planning is needed. Such planning must concern itself with the possibilities for a number of mutually supporting types of enterprises such as wage-paying industrial enterprises and subordinate specialized agriculture. Possible wage-paying industries would include mining, forestry, commercial fishing, and the accommodation of tourists and big game hunters.

Physical and economic research may be needed. The plan must fit specific uses to specific areas and resources and contain a program for needed internal public improvements such as roads, airfields, ports, and mail and school facilities. Any needed changes in existing laws to make possible the application of the plan must be determined. The character and extent of any public aid to private initiative deemed desirable in the interest of encouraging actual development and settlement under the plan should be indicated.

In addition to the improved social and economic conditions that should result from a locality-by-locality development in Alaska, there is the added assurance that in the long run such a procedure would prove less expensive to the governmental agencies supplying the social facilities for the Territory's population. But the carrying out of this type of program would not be without difficulties.

The policy which is here suggested is the application of the principle of zoning which, though long practiced in guiding the land use in cities, has only recently received intensive study and initial application to rural areas in the States. The tragic experiences in several States because of the wrong use of land may, in large part, be avoided in Alaska since most of the land there still belongs to the public.

Any zoning program, however, must not only be based on sound knowledge of the appropriate uses for differing areas, but it should, of course, include provisions for adjustment as more complete information is obtained or as new and increased human needs require.

Flexibility is implicit in all intelligent planning for land use.

There are certain basic legal foundations essential for the successful functioning of such plans. These include those remote legal rights relating to land settlement and land exploitation which were built up before the conception of land use planning had any place in American public affairs. The homestead and metal mining laws by which private ownership or use of resources is obtained in Alaska were not designed to facilitate a planned and orderly development of the Territory. Past experience indicates that homesteads entered on land too poor or too remote to permit a decent living cause social losses and require excessive outlays for public services (roads, schools, police, health, etc.). Gold mining operations under the present mining laws may jeopardize orderly development and the best use of the combined resources of planned areas. Consideration should be given to the problem of modifying the homestead and mining laws so as to prevent practices not in harmony with the objectives set forth in the preceding discussion.

In view of the considerations set forth above, the Committee, therefore, recommends:

That a program of investigation and integrated planning be initiated for specific, compact, localized areas which appear most favorable to development at this time. Such a program of development should be undertaken for the purpose of creating a sound permanent economy for the regions involved by a comprehensive resource use and a fairly compact settlement.

Available information indicates that the Kenai Peninsula, due to its varied resources and its accessibility, offers a promising area for a well-rounded development. A program of areal planning work might give consideration to the future development of this region.

Transportation and Communication Needs

The regional subdivision of the Territory—to say nothing of its vastness—points to the imperative need for transportation. The sparse and scattered population, which means a similar dispersion of economic activity, gives rise to special problems in transportation and communication.

All plans for the inauguration of new lines for basic forms of transportation, such as freight carriers by water or land, should be delayed pending the formulation of general plans for the development of Alaska and pending a beginning in the execution of such plans. This is not intended to forestall present necessary requirements. Those areas for which adequate information on natural resources is lacking should not be

tapped by speculative building of railroads or high class highways until such information is available. It may easily turn out that there is nothing of sufficient present economic value to tap.

It is true, to be sure, that Canada has followed a different policy by building railroads to open territory to the north of that tapped by the first transcontinental line, the Canadian Pacific. But conditions in Canada are quite different from those that obtain in Alaska. Canada is under far greater pressure than the United States to expand northward. Furthermore, the regions opened by the railroads are relatively flat and lie far to the south of all of Alaska except the panhandle of southeastern Alaska.

A good deal of pulpwood is found in the Canadian regions tapped by the railroads and the conditions for farming are generally much better than in Alaska. Even so there has been much hardship and disappointment in the development of these areas, and the poor financial condition of the railroads is well known.

The construction of new railroads at the public expense in Alaska is of doubtful wisdom at this time. The present railroad system should be extended only where and when it is reasonably certain there is a permanent need and only after the essential planning has been done, without which the existence of the need cannot be established. The Committee does not believe that if and when railroad construction is begun again new roads should be expected to pay their way completely. So long as the Territory contributes to the wealth of continental United States, as evidenced, for example, by its one-way trade, it has a claim on the Federal Government which cannot be treated as a mere business proposition.

The Government would be warranted in looking upon moderate railroad deficits as a justifiable contribution to the development of the Territory. It could reasonably anticipate as a result of such development an increase in Alaska's contribution to the national welfare.

It may be observed that the development of the potential resource wealth of Alaska, considering the prominent part that utilization of mineral deposits will undoubtedly play, will depend in large part upon the flexibility of the transportation and communication system. Adequate facilities seem out of the question and economically impracticable if transportation and communication needs are to be thought of in terms of a system of trunk railroads and trunk roads. These are least flexible of all transportation and communication facilities, and unless there is a well-established need and they are necessary to a well-conceived plan, there is grave danger that they may be built in response to a temporary or imaginary need and that the volume

of traffic over them will never, or at least not for many years, be sufficient to justify the expenditures incurred.

Minor roads and trails are another matter. These are of the utmost value in assisting the opening of the country. Their cost is relatively low and they may be considered only an auxiliary to any fundamental transportation and communication system. Once a need has been established for a low-cost minor road or trail, construction cannot be begun too soon or pushed too fast. Considerable expenditures are then warranted. No doubt many such needs could be established today, and wherever they can be established as reasonably permanent, construction should be begun.

What should be avoided is the construction of roads, more or less haphazardly, on the gamble that they will open up country not demonstrated to be worth opening up, or to mining camps not proven to have more than a temporary existence. Planned road construction is particularly important in the development of Alaska in order to reduce to a minimum the scattering of the population over a wide area, a condition that results in an excessively high cost for adequate government.

In the construction of roads, and indeed of all public works, the greatest possible use should be made of resident labor. The economic handicap to the development of the Territory from the importation and exportation of laborers has already been pointed out. The Federal Government should avoid adding to it, even at a price.

The Committee did not possess the time nor staff to make an adequate study of the water transport facilities between Alaska and the continental United States and within the Territorial waters. Therefore, it is not qualified to indicate entirely the need of Alaska commerce in this respect.

The Committee understands that the United States Maritime Commission is making a study of the principal trade routes and areas served by the American merchant marine. Since Alaska depends entirely upon water transportation for carrying goods and people between the Territory and the continental United States, it is suggested that the Maritime Commission might well extend its studies of the American merchant marine engaged in our foreign trade to those water transport facilities in our domestic trade which serve Alaska.

Appropriateness of Air Transportation

No system is more flexible or more rapid than air transportation, and perhaps no other development in transportation and communication so closely and so economically answers the short-term need for making remote regions accessible and bridging the vast distances characteristic of Alaska. The advancement of

air transport facilities also is recommended by the assistance it offers in speeding up mail service and in facilitating such miscellaneous government activities as health service, law enforcement, game and forest protection, and mapping work. Furthermore, from a standpoint of national defense, anything that will assist in assuring unbroken lines of communication is vital to the national interest.

Fortunately, even a modest further development of air transport facilities will provide a substantial base for a rapid enlargement of the services when they are needed. For Alaska an airway system seems entirely feasible and wise as a primary means of transporting people, mail, and express matter. Air services may also play an important part in freight transportation, particularly for remote mining regions.

In view of the conditions outlined above, the Committee recommends:

That the development of transportation and communication facilities for Alaska be limited to a program to meet current needs only; that pending the formulation of general plans for development, no projects be advanced or justified upon prospective future needs; and that in view of conditions found in the Territory special consideration be given to the expansion of air transport systems which seem peculiarly adapted to the various transportation, communication, and related needs of Alaska.

Proposed Pacific-Yukon Highway

Where the territory of the United States borders on Canada, the road systems of the two countries obviously must articulate. There should be, and no doubt is, cooperation between the two countries in this respect. Hence, whenever Canada decides to build its section of the proposed highway extending from some northwestern point on the international boundary through British Columbia and Yukon Territory into Alaska to Fairbanks, the United States should cooperate by building those portions within United States territory, since the benefits to the American people, would be substantial.

Other Considerations in Planning Development

Conservation of the Fisheries

The fisheries present a brilliant example of a successful conservation policy. Not so long ago it was feared that overfishing was threatening to ruin the industry. Today the annual pack is greater than ever. In fishery questions and research relating to fisheries the United States should seek the closest cooperation with Canada. The halibut treaty with Canada is a model of its kind and the new treaty dealing with the

sockeye salmon of Fraser River and Puget Sound bids fair to be similarly advantageous.

Salmon spawn in the headwaters of streams and then die. The area of the spawning beds seems to be limited in each stream. It may be that overcrowding of the beds by spawning fish reduces rather than increases the number of fry produced each year. It is probable that only a given number of fish are necessary to obtain the maximum number of adult fish each year. This number is probably different stream by stream and should be determined for all important spawning streams. It might be possible so to regulate the number of fish permitted to enter the streams as greatly to increase the fish available for canning.

This is but one of several scientific problems connected with the salmon runs. Little is known of the habits of the salmon while at sea. Moreover, much of what is known about the life history of salmon is limited to those regions of Alaska where they are taken in commercial quantities. It is well known that they occur elsewhere, for example, all the way out to the westernmost part of the Aleutian Islands chain. It is very important that studies be made with despatch to fill this gap. Japan has been studying the possibilities of fishing off Bristol Bay. If the Japanese should begin commercial operations, the runs of salmon in the streams of that region, perhaps the best for red salmon in Alaska, would be jeopardized. The principal industry might be greatly injured. There is, therefore, no question of greater immediate import for the present and the future welfare of the Territory. The Federal Government should take immediate steps both to insure the preservation of the Pacific salmon fisheries and to secure the peculiar important American interests therein.

It is unfortunate from the viewpoint of Alaska that the salmon canning industry imports a large part of its workers from Seattle and San Francisco. It might be wise for the Territory to offer some inducements to canning concerns to increase the employment of resident labor.

The waters of Alaska yield a number of other species beside halibut and salmon, of which few, except herring and some cod, are used commercially. There is also a certain amount of canning of shellfish and shrimp. More attention might be given by the appropriate agencies to the establishment of industries based on species not now fully utilized.

Relation of Mining to Planning

For the development of mining, the importance of mapping, geological and other exploration, transport, and study of water resources has been given consideration in other sections of this report. There remain, however, the relation of mining to planning for the

Territory and also one or two minor matters, which have not yet received adequate treatment.

Any stimulus or encouragement to one industry, assuming that this may be justified in the national interest, will tend to benefit others. Certain developments unrelated to mining would follow an expansion of mineral exploration. Mining, however, unless it is of the lode type tends to break down the objective of permanent building in compact areas involving a full utilization of resources.

To some students, the greatest single weakness in the resource position of the United States proper, despite the advanced state of technological development, is the vast amount of space involved. America has been termed "an experiment in transportation." The same observations would seem to apply to an even greater extent to Alaska. The tempo of economic and social life is faster where resources are concentrated in small compact areas. Even without the geographical handicap, insofar as transportation is concerned, the task of building an economy, supplying police and health protection, schools, justice, and mail service to a handful of people scattered over thousands of square miles is almost insurmountable.

For this scattering of population centers, mining is very largely responsible. A heavy emphasis upon mining is well-nigh inconsistent with orderly planning. Minerals are apt to be found in the very places least suited to living or to the integrated development of other resources.

Perpetuation of Wild Life

Wild life is an important resource of Alaska. The fur bearers and game animals have always contributed and still contribute directly and substantially to the livelihood of a great majority of the local Native population, and to a smaller but large number of the whites. Both sound economics and sentiment call for the perpetuation of the wild life resources in abundance.

Although many localities of Alaska are susceptible to fairly intensive development, huge areas doubtless will remain in a wilderness or near wilderness state for some time to come. There can be no question of ability to maintain an abundance of the many important local species of wild life with regard to suitable and sufficient habitat.

Wild life depletion that resulted from settlement of the West, and the value of the Alaska wild life to the Territory and the entire Nation indicate that strenuous efforts should be made to maintain and to increase under certain conditions, the present large numbers of animals in the Territory. All land use development plans will need to give adequate recognition to wild-life protection and management.

The Federal Government administers the Alaska wild-life resources. Protective laws with minor

changes for clarification and practicability are generally adequate for present conditions in the Territory, but information available indicates that work of an investigational nature should be expanded materially. Predators, especially wolves and coyotes, are on the increase and need to be brought under better control. There is a dearth of scientific information on many subjects which present problems to the administrators such as breeding habits, food and cover requirements, and diseases; physical conditions on game ranges and wild fowl nesting grounds should be surveyed and better protection against illegal killing should be provided.

Expansion of Recreational Use

Alaska is a land of outstanding recreational features. The fact that it is the last truly frontier region under the control of the United States is of itself a matter of great appeal to most Americans. Its intricate network of fiords, great glaciers, lofty mountains, active volcanoes, forested hills, tundra areas, distinctive big game, and excellent sport fishing offer more of variety and interest in its wild state to the lover of nature than perhaps any other part of the country.

The total number of visitors to Alaska, however, is still very small in comparison with the number that annually makes use of the recreational areas in the West. A trip to Alaska involves more time and expense, and must be made by steamer, there being no highways connecting Alaska with continental United States. Within Alaska there is a lack of adequate transportation, hotel, and recreational facilities.

Notwithstanding these handicaps, the recreation industry has become an important factor in the economic life of Alaska, and with proper planning and management there is reason to believe that it can reach the proportions of a major industry of the Territory.

While promotion of the tourist trade should doubtless be left largely to private enterprise, the Federal Government, as the owner of the recreational areas, might properly take steps to improve the opportunities afforded the people to enjoy these, at the same time providing a means for advancing the economic welfare of the Territory. This purpose could be accomplished by the construction of roads and trails, protection and preservation of historical and archeological sites, establishment of game refuges, development of national parks and monuments, and protection of the scenery and wildlife of the public domain through the control of forest and brush fires.

Before any action is taken to obtain increased recreational use of Federal lands, the possibilities should be carefully explored in the several regions; also any resulting program should be closely coordinated with plans for other forms of land use and development in the same region. The Committee recommends that

a study be made by the proper Federal agencies of the possibilities for promoting increased use of recreational features in Alaska, as a part of coordinated plans of regional development.

Possibilities for Establishing New Industries

The Committee has made such study as the time at its disposal permitted of the possibility of establishing in Alaska new industries other than small establishments to meet a local demand. A number of the staff reports in Part II suggest possibilities for the establishment of local small-scale industry, but the only major industry which seems to have definitely favorable prospects at this time is a plupwood and newsprint industry, discussed in the staff report on Forest Resources. The Committee has been unable to discover a single industry that seemed promising which is not discussed in these staff reports.

Capital for Public Investments

Development throughout the Western States was actively supported by the Federal Government by means of large land grants in behalf of transportation and public education. This aid certainly promoted and facilitated the investment of other capital and made it possible for the early population to overcome obstacles otherwise insuperable. Alaska, unfortunately (or perhaps fortunately), arrived at the settlement stage about the time that this particular policy began to fall into disrepute. The need for public investment in behalf of transportation and other public services has not been so freely recognized simply because the methods of meeting the need could not be so "painless."

The Committee has pointed out previously that Alaska has a claim to substantial contributions from the Federal Treasury, and Federal funds made available through appropriation by the Congress can be used as capital for developmental purposes, such as public works and services. It was also noted, however, that if this claim were pushed to such an extreme that the Federal Government would pour large amounts of capital directly and indirectly into the Territory so as to accelerate development and subsidize many sorts of industry indirectly, the cost would probably be so enormous and the outcome so doubtful that this type of development was dropped from further consideration by the Committee.

There is the possibility, however, that the Alaskans under the powers of their Territorial government might wish to hasten the Territory's development independently of Federal aid.

If a new country wants to get capital for development the historical process has been to borrow it abroad, in this case presumably from private banking organizations in continental United States. If nei-

ther private capital nor the Federal funds are available, there is but one alternative procedure—it is for the Territorial government to encourage its people to save. It can do so by imposing taxes, and then use the revenue for public works to develop the country.

More than most undeveloped countries, Alaska would probably be justified in taking this course, because: (1) its principal industry—salmon canning—is mostly under absentee ownership and employs much imported labor, (2) a large portion of its exports is gold, and (3) it has no large number of wealthy citizens and property owners who can pay larger taxes.

The Territory already imposes a tax on canned salmon which is a yield tax on its fish resources.

Alaska also has what amounts to a yield tax of 3 percent on gold production in excess of \$10,000. The Committee believes this form of tax to be unwise, since high-grade mines are taxed at the same rate as low-grade mines, although the former are relatively less beneficial to the Territory. A better plan would be to favor the low-grade mine using more labor. Or the system of South Africa appropriately modified might be adopted. There the tax on gold and diamond mining is very much heavier than in Alaska.

Furthermore, if the plans set forth in the staff report on Forest Resources are carried out, there should be little reason to tax the export of forest products, because these will be highly manufactured in the form of newsprint. However, the interest of the people can be protected in the forest leases yet to be drawn. The Committee believes there need be no occasion for severance or yield taxes on forest resources, which in one or two States exceed 10 percent.

In any event, yield or severance taxes if adopted for the purpose of accumulating capital should be made very substantial, although not so heavy as to discourage unduly salmon canning or mining. The taxes should not be heavier in any event than is necessary to collect the maximum amount of revenue. Whether existing taxes are already heavy enough, too heavy, or too light, the Committee is in no position to say. This is a matter for careful study by experts, for the subject is very complex. Because a large part of the salmon pack is exported, it would probably be advisable to provide for a "drawback" on any sent abroad so as not to hamper foreign trade unduly.

The revenue thus accumulated should be looked upon as capital for the development of the country rather than as income to meet the current expenses of government. It should be invested in enterprises of permanent benefit to the country, such as public works of all kinds. In time, a good deal might be invested in various enterprises and industries of a semipublic character which private enterprise cannot be induced

to undertake until the demonstration has been made that they can be commercial successes.

**A Permanent Alaska Planning Agency;
the Timing of Development**

While the Committee has had the invaluable assistance of the Alaska Planning Council, the Federal Alaska Committee, and the Pacific Northwest Regional Planning Commission, nevertheless it has not felt itself in a position to make specific and detailed recommendations on most of the matters it has considered. To do that is the task either of some special temporary planning committee with sufficient time and funds to make a thorough inquiry, or of a permanent Alaska planning agency. The latter is the better kind of organization, both to advise Congress what kind of general policy to adopt for Alaska, and to propose the times when various parts of the plan should be executed.

The President on June 3, 1937, asked Congress to create seven regional planning agencies, under the general jurisdiction of a permanent national planning board, to develop "integrated plans to conserve and

safeguard the prudent use of waters, water power, soils, forests, and other resources of the areas entrusted to their charge." These agencies would also "provide a useful mechanism through which consultation among the various governmental agencies working in the field could be effected for the development of integrated programs of related activities."

In our judgment this recommendation should include an eighth region, comprising all of Alaska, and the legislation that is finally adopted for regional planning should apply to Alaska as well as to the continental United States. We point out in passing that when the membership of the Alaska planning agency is determined, the related interests of the Territorial government and the Pacific Northwest should be recognized.

The execution of a broad plan must inevitably be by a series of steps. Timing is something that should be determined, changed as important changes in conditions occur. But a national policy or plan for Alaska ought not to vacillate with the shifting winds of politics. It should be altered only as broad trends in technology indicate the need of alteration or as national social aspirations undergo substantial change.

CONCLUSIONS AND RECOMMENDATIONS

1. The Committee has found that so much essential information is still lacking for Alaska that it would not have been able to set up an adequate plan even if the necessary time had been available. The development of Alaska is a long-time problem and plans will have to change to suit changing social conditions. This task, as we have just explained, ought to be entrusted to a permanent Alaska planning agency the membership of which reflects territorial and national interests. It should compose one unit in a planning structure with a national planning agency in charge of "over-all" planning coordination.

2. Because the country is so vast and so cut up by formidable barriers of mountain ranges and fiords, the Committee is of the opinion that any planning agency that may be set up will find it necessary to divide the country into planning regions based on geographic and economic considerations. It recommends that the execution of any plan proceed region by region, beginning where integrated planning seems most feasible.

3. The Committee believes that the filling of the wide gaps in such knowledge as is necessary for the intelligent direction of Alaska affairs should be hastened. Information about the Territory is wholly insufficient for any adequate program. Surveying, mapping, land classification, mineral exploration, and other scientific investigations already in progress should be carried forward at a faster pace than at present. In the interest of speed and broad general utility the Committee recommends in particular the early and speedy completion of general mapping, including aerial mapping. The Committee recommends further that, while the execution of aerial mapping may be left to a single agency, the planning of the methods to be employed should be in the hands of a committee representing the several Government agencies that will make use of the aerial maps.

4. The Committee has reached the conclusion that the national interest does not demand a forced development of Alaska. There is no pressure of population, lack of raw materials, or trade in the United States that demand exceptional measures. Furthermore, the Committee has reached the conclusion that the economy of Alaska cannot be based on farming, the usual basis for settlement of new countries. Agriculture there is and more, no doubt, there will be, but it must follow industry and for a long time to come be supplemental to it. Alaska is not now prepared to receive large numbers of surplus farmers from continental United States. Nor

has the Committee been able to discover new industries other than those suggested in Part II of this report which seem to fit the Alaska of today. Newsprint and forest products are the most important prospective industries and development in this direction is very promising.

5. The country is so vast that one of the major needs is better communication and transport. The Committee therefore recommends that the less expensive types of roads, and also trails, be built wherever there is a demonstrated need. It does not recommend the building of railroads or high-class highways for an anticipated future need prior to the formulation of general plans for the development of the Territory. It recommends, further, that steps be taken, as soon as possible, to extend and perfect air transport. With the physical conditions obtaining in Alaska, it is obvious that no other means of transport can do so much for the country or at as low a cost.

6. The Committee also believes that the administration of the conservation policies—not the general policy itself—needs reexamination, especially with reference to the terms of leases, alienation of land, the homestead law as it applies to Alaska, and the like. It makes a recommendation to that effect.

7. Since the random occurrence of mineral deposits renders the orderly and effective development of Alaska difficult, if not impossible, the Committee recommends that suitable steps be taken, by modification of mining laws, if necessary, or otherwise, to insure that the Government may retain such control over mineralized areas about to be opened up as is in the interest of orderly and efficient development.

8. In view of certain abuses in labor conditions in the past, it is important that the greatest vigilance should be observed by the United States Government and the Territorial government in order to insure reasonable working and living conditions and to prevent the exploitation of labor in Alaska.

9. The Committee recommends that the system of taxation be examined to the end that it may be simplified, made more just, and, above all, to determine whether the revenue derived from the principal industries may not be increased to the end that more of the wealth derived from natural resources be used for the development of the country.

10. The Committee believes that the framework of government in and for Alaska is not now as efficient as it could be and suggests that a study be made looking

toward simplification and improvement. It has not felt itself able to make more definite recommendations than those contained in the body of the report. Such a study should reexamine the whole pattern of the Territorial government, ways and means of minimizing the unfortunate results of the geographic fact that Alaska is so distant from the seat of government, and ways and means for the improvement of the administration of justice and police protection, having due consideration

of the difficulties introduced by the existence in the Territory of native cultures.

ALASKA RESOURCES COMMITTEE,
CARL L. ALSBERG, *Chairman*,
PAUL W. GORDON,
B. F. HEINTZLEMAN,
CHARLES MCKINLEY,
GEORGE F. YANTIS.

PART II

STAFF REPORTS

NOTE

The publication of these staff reports does not imply that the President, the National Resources Committee, or the Alaska Resources Committee concurs in the recommendations contained therein. The views and opinions expressed are those of each of the groups responsible for preparing the individual reports

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INTRODUCTION

The material in this part of the report includes a series of staff reports on specially selected topics prepared from data submitted by 30 different Federal bureaus and 9 independent agencies. To facilitate the preparation of this material, a special Federal Alaska Committee was organized consisting of the following official representatives of the Federal departments and independent agencies:

Chairman Paul W. Gordon, Division of Territories and Island Possessions, Department of the Interior.

Frank T. Bell, Commissioner, Bureau of Fisheries, Department of Commerce.

Golden W. Bell, Assistant Solicitor General, Department of Justice.

Harlee Branch, Second Assistant Postmaster General, Post Office Department.

John J. Corson, Assistant Executive Director, Social Security Board.

Anthony J. Dimond, Delegate from Alaska, House of Representatives.

Robert Fechner, Director, Civilian Conservation Corps.

F. G. Frieser, Traffic Adviser, Maritime Commission.

Hugh S. Hanna, Bureau of Labor Statistics, Department of Labor.

Lt. Col. R. P. Hartle, War Plans Division, General Staff, Department of War.

John Hickerson, Assistant Chief, European Affairs Division, Department of State.

Capt. Royal E. Ingersoll, Director, War Plans Division, Office of the Chief of Naval Operations, Department of the Navy.

Dr. E. C. Johnson, Chief Economist, Farm Credit Administration.

Roger B. McWhorter, Chief Engineer, Federal Power Commission.

C. E. Rachford, Office of the Coordinator of Land Use Planning, Department of Agriculture.

Thomas H. Riggs, Commissioner, International Boundary Commission, United States, Canada, and Alaska.

Emerson Ross, Director, Division of Research, Statistics and Records, Works Progress Administration.

Dr. Phillip S. Smith, Geological Survey, Department of the Interior.

Rear Admiral R. R. Waesche, Commandant, the Coast Guard, Department of the Treasury.

E. M. Webster, Acting Assistant Chief Engineer, Federal Communications Commission.

Dr. W. H. Young, National Bituminous Coal Commission.

Secretary Robert W. Hartley, National Resources Committee.

In addition the Alaska Planning Council, through its chairman, B. Frank Heintzleman, assisted in the preparation of many of the staff reports by making available its experience, advice, and views on several of the subjects studied.

The Alaska Resources Committee did not have the opportunity to examine and evaluate in detail all of the conclusions and recommendations contained in these staff reports. The major recommendations which have the approval of the Alaska Resources Committee appear in Part I. The statements and recommendations in the following pages represent the views of the authors listed with each paper.

Except as otherwise noted, these papers were prepared and written by the various committees representing the Federal bureaus and agencies concerned. It is hoped that they will place at the disposal of the Congress pertinent facts and data regarding both the physical and human resources of Alaska.

POPULATION¹

The population of Alaska on October 1, 1929, according to the Fifteenth Census was 59,278. This was probably the most complete census made of the Territory. The first enumeration of its population by the United States was made in 1880 and consisted of a canvass of all accessible settlements, supplemented by estimates based mainly upon records and personal knowledge of missionary priests for those regions which could not be visited. A similar practice was followed in 1890, but the area actually canvassed in that year was larger than that visited in 1880, and at each subsequent census the enumerations have been more nearly complete and accurate. After a careful consideration of the unusual climatic conditions, the wide dispersion of small population over large areas, and the inaccessibility of certain regions, October 1, 1929, was decided upon as the date of enumeration of the Fifteenth Census. Based upon the enumerations as accomplished 1890-1930 fluctuations in the population of the Territory would appear as follows:

Territory of Alaska population changes, 1890-1930

	1930	1920	1910	1900	1890
White population.....	28,640	27,883	36,400	30,493	4,298
Native population.....	29,983	26,558	25,331	29,536	23,531
Other races.....	655	595	2,625	3,563	4,223
Total.....	59,278	55,036	64,356	63,592	32,052

Distribution of Population

From the foregoing it will be evident that the population of Alaska is sparse. The gross area of Alaska, land and water, is 586,400 square miles. The average number of inhabitants per square mile in 1930 was slightly more than one-tenth of 1 as compared with less than one-tenth of 1 in 1920. The first judicial district of the Territory or southeastern Alaska shows the greatest density of population, 33 percent of the total population of the Territory being within the limits of this district. Likewise four of the seven towns of Alaska having a population of 1,000 or over in 1930 were located there, namely, Juneau, Ketchikan, Petersburg, and Sitka. The total population of this district is listed at 19,304. The four towns mentioned had a population of 10,147 or more than one-half of the population of the district.

¹ Prepared from material submitted by Paul W. Gordon, Division of Territories and Island Possessions; Dr. Willard Beattie, Office of Indian Affairs; Dr. Joseph F. Van Ackeran, Public Health Service; Hugh S. Hanna, Bureau of Labor Statistics. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

The least populous district is the second located in northwestern Alaska with only 10,127 persons, or 17 percent of the population of the Territory. Only one city in this district, Nome, had a population of more than 1,000 persons. The remainder of the population was located in small villages, the largest of which had only a few hundred persons. The third district recorded 16,309 persons and the fourth 13,538, or 27 percent and 23 percent, respectively, of the inhabitants of the Territory. Each of these districts had a town of more than 1,000 persons, Anchorage and Fairbanks, respectively.

The following table indicates the distribution of the population by size of towns:

District	Number of towns having a population of—			
	100-300	301-500	501-1,000	1,001 and over
First.....	8	8	3	4
Second.....	23	1	1	1
Third.....	19	5	2	1
Fourth.....	16	2	.....	1

POPULATION FIGURES BY CENSUS REPORTS

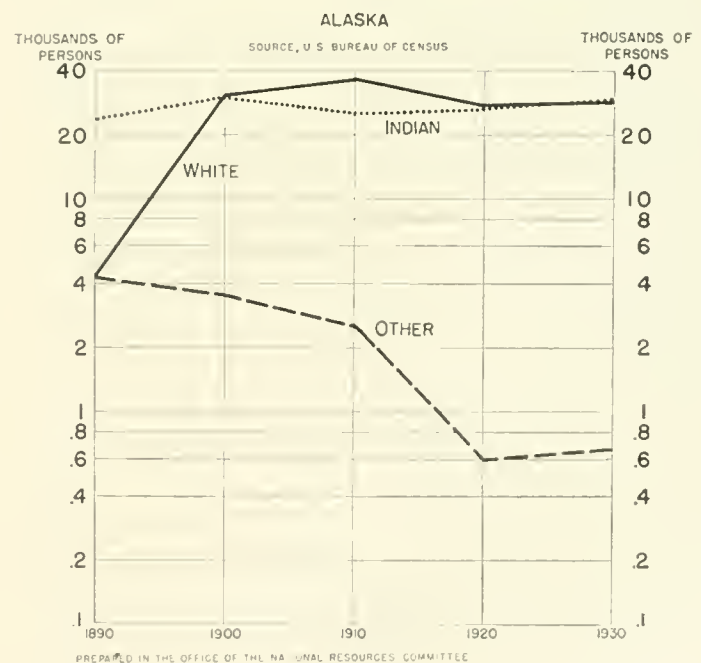


FIGURE 2

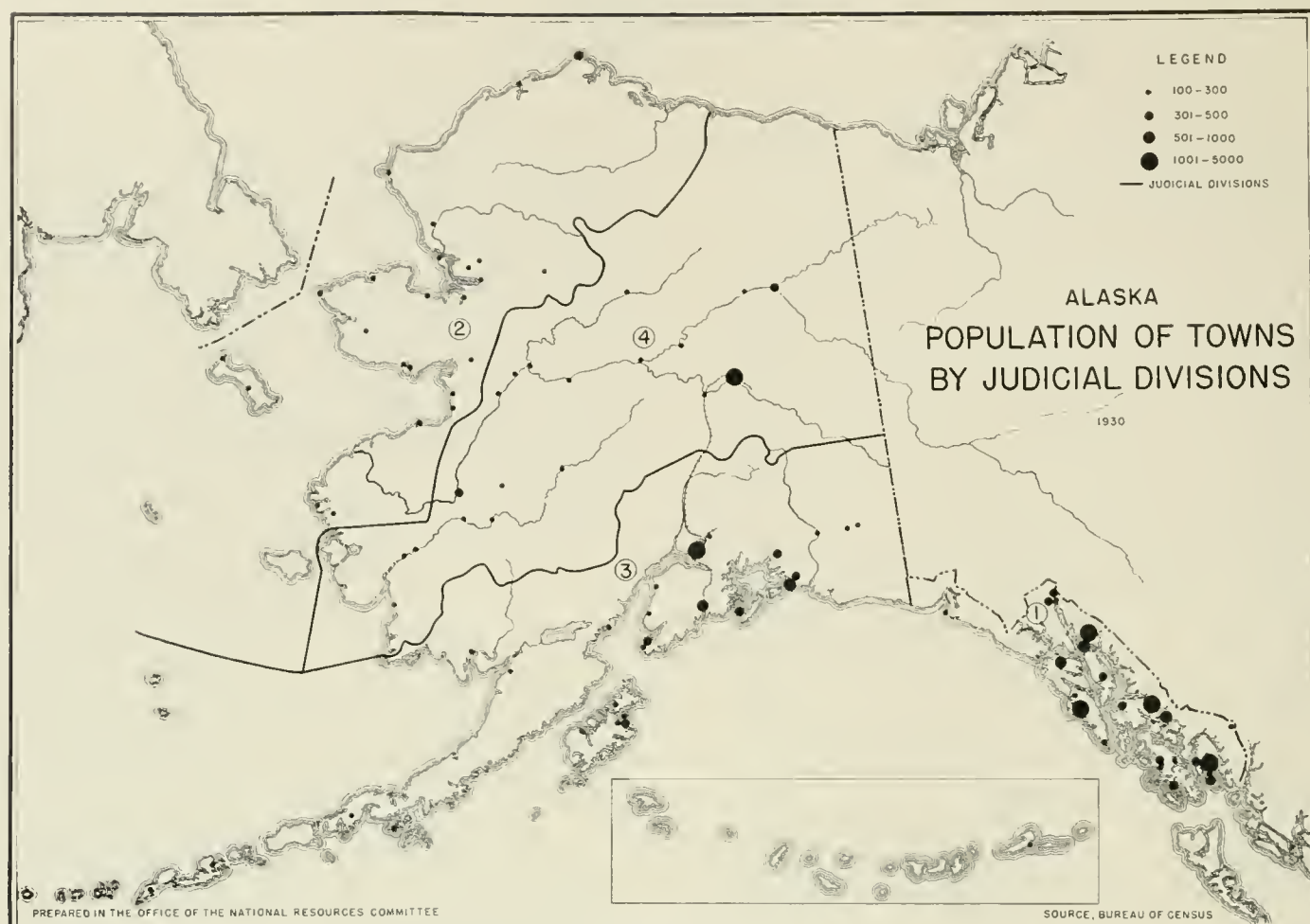


FIGURE 3

Composition of Population

According to the 1930 census the population was about evenly divided between native and white—29,983 natives and 28,640 whites. The greatest number of natives resided in the second district, 8,686, but the district having the greatest proportion of the natives to the entire population of the area was the northern in which 85 percent of the persons enumerated were natives. The following table indicates the geographical distribution of the population of the Territory in 1930.

	Total	Per- centage of Terri- tory	Native	Per- centage of dis- trict	Total white	Per- centage of dis- trict	Total other	Per- centage of dis- trict
		Per- cent		Per- cent		Per- cent		Per- cent
First district	19,304	33	5,990	31	12,877	67	437	2
Second district.....	10,127	17	8,686	85	1,427	15	14	-----
Third district.....	16,309	27	7,298	45	8,848	54	163	1
Fourth district.....	13,538	23	8,009	59	5,488	41	11	-----
Total Alaska.....	59,278	100	29,983	-----	28,640	-----	655	-----

Of the total population of 59,278 in 1930, there were 35,764 males and 23,514 females, or approximately 152 males to each 100 females. This disparity is still more marked among the white population of 28,640, only 8,736 of whom were females, or a ratio of 228 males to each 100 females. The Indian population of 29,983 was about evenly divided, with 15,359 males and 14,624 females.

Of the foreign born, Norway leads with 24 percent, followed by Sweden, 11.7 percent; Canada, 9.9 percent; Germany, 9.6 percent; England, 6.1 percent; and Finland, 5.8 percent.

The following table shows the trend in the white population, male and female, by certain age groups, 1890-1930. Perhaps the most significant factors are the age distributions of the male whites and the growing proportion of white females.

	1930	1920	1910	1900	1890	1880
Total population.....	59,278	55,036	64,356	63,592	32,052	33,426
White population.....	28,640	27,883	36,400	30,493	4,298	
Indian population.....	29,983	26,558	25,331	29,536	23,531	
Other races.....	655	595	2,625	3,563	4,223	
White population.....	28,640	27,883	36,400	30,493	4,298	
Native.....	18,460	16,286	18,426	21,709		
Foreign-born.....	10,180	11,597	17,974	8,784		
Male.....	19,904	20,586	30,334	27,263	3,853	
Under 5 years.....	754	850	614	301	71	
5-9 years.....	812	721	435	272	64	
10-14 years.....	745	493	302	223	41	
15-19 years.....	696	531	611	372	102	
20-24 years.....	927	1,044	3,113	1,801	432	
25-29 years.....	1,342	1,573	4,717	2,866	785	
30-34 years.....	1,429	2,263	5,050	3,242	780	
35-44 years.....	3,945	5,104	8,461	5,099	928	
45-54 years.....	4,240	4,448	4,844	2,162	462	
55-64 years.....	3,131	2,525	1,434	749	162	
65-74 years.....	1,531	718	312	133	26	
75-100 years and over.....	295	127	47	19		
Unknown.....	54	189	394	10,054		
Females.....	8,736	7,297	6,066	3,200	445	
Under 5 years.....	727	815	614	280	67	
5-9 years.....	770	675	427	275	51	
10-14 years.....	697	506	319	193	46	
15-19 years.....	564	368	316	155	41	
20-24 years.....	671	518	548	297	44	
25-29 years.....	832	810	847	452	52	
30-34 years.....	825	882	860	401	45	
35-44 years.....	1,785	1,487	1,358	480	48	
45-54 years.....	1,146	820	496	203	35	
55-64 years.....	489	284	160	63	13	
65-74 years.....	167	76	51	11	3	
75-100 years and over.....	49	25	7	4		
Unknown.....	14	31	63	383		

DISTRIBUTION OF POPULATION BY JUDICIAL DIVISIONS

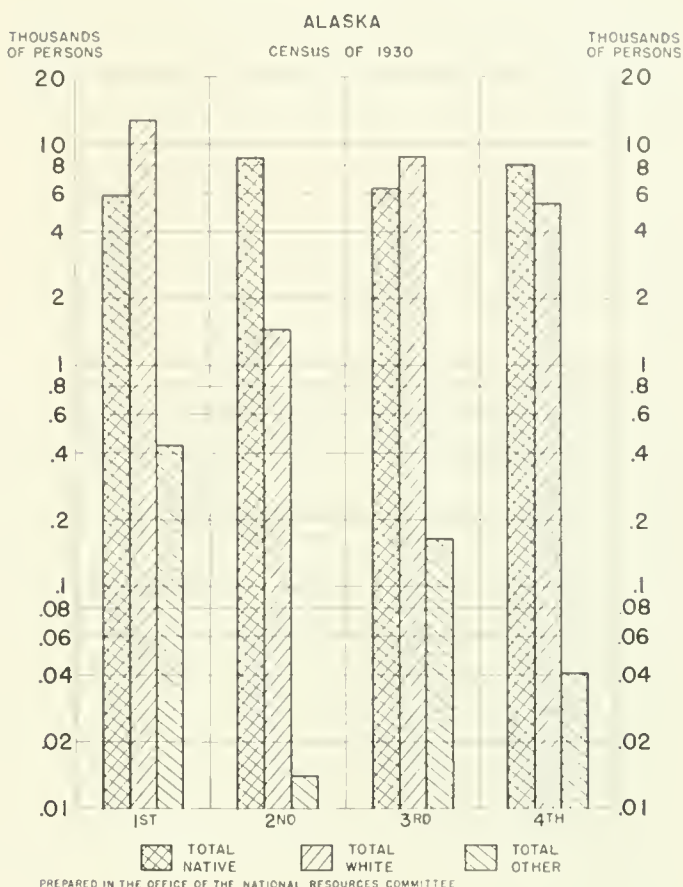


FIGURE 4

Social and Industrial Conditions

In giving consideration to the sparseness of population thus portrayed it must be remembered that industrial conditions with seasonal fluctuations in the demands for labor cause a large migrating population and tend to retard permanent settlement. This is particularly true when those industries demanding seasonal labor require a predominant number of men. Statistics compiled for the calendar year 1936 show 33,653 persons to have arrived from United States and British Columbia and 30,957 to have returned. These arrivals and departures are each approximately equivalent to one-half of the population of the Territory or equal to the number of permanent white residents in 1930. Nor was the year 1936 an unusual one. Similar tabulations 1930-35 show the arrivals in the Territory to have been 30,231, 25,497, 17,090, 16,117, 24,009, and 29,427. Departures showed the same range. Not all those traveling to Alaska as indicated by these figures were engaged in industry. But even after making suitable allowances for purely tourist traffic the figures, from the standpoint of migratory labor, are still significant.

Any discussion therefore, of the development of those natural resources of the Territory which would offer continuous employment or which would supplement the present employment in off-season periods is particularly pertinent to the problem of stabilizing the Alaska population and its parallel problem, that of increasing

the number of permanent inhabitants will be dealt with in the staff reports on Agriculture, Forest Resources, Mineral Resources, and Aquatic Resources.

As important as may be the desirability of increasing Alaska's permanent population, living conditions and labor conditions under which that population is to live are equally as important.

Limited Information

Information regarding existing labor conditions in Alaska is extremely limited. For reasons noted later, the Federal agencies, such as the Department of Labor, concerned with the collection and dissemination of information regarding wages and working and living conditions in the United States, have never been able, except on rare occasions, to extend their fields of operations to cover Alaska. Also, the Territorial Government, no doubt because of the vast area of the country and its limited budget, has been able to do comparatively little along this line. The periodic reports of the Commissioner of Mines give a very good picture of the mining industry, especially with refer-

ence to production and operating factors, and the annual reports of the Governor usually touch on certain labor topics. In total, however, the available knowledge of labor conditions and labor relations in Alaska is far less complete than exists for the continental area of the United States, and also less complete than our knowledge of the natural resources of the Territory.

Labor Organization

Labor organization is quite general among the Alaskan fishermen, through units of the International Seamen's Union and also among certain groups of railroad employees and Federal employees. It is less general in the mining industry. Of recent years, organization has extended to the canning industry in certain sections, and a central labor council in Cordova, chartered by the American Federation of Labor in April 1937, includes locals of the International Longshoremen's Association and of the Hotel and Restaurant Employees' International Alliance, as well as two directly affiliated American Federation of Labor unions (canning workers and clam diggers) and a local union of transport workers. Among the building trades, Alaska is included within the field of activity of at least one international union—the United Brotherhood of Carpenters and Joiners.

Labor Legislation

The Territory of Alaska has a long record in the field of labor legislation. It was the first jurisdiction in the United States to provide for old-age pensions (1915), and it was among the very first of the jurisdictions to enact a workmen's accident compensation law (1915) and to establish a maximum eight-hour workday for underground miners and associated employments (1913). In 1913 it established the office of Territorial mine inspector and in 1917 a code of mining regulations, which provided, among other things, for the protection of dangerous machines and equipment, for the reporting of accidents, and for the prohibition of the underground employment of boys under 16. In 1919 legislation was enacted providing for a code of sanitary and safety regulations for factories, canneries, and other establishments, covering such subjects as cleanliness, drinking water, toilet facilities, and temperature.

Other Territorial labor laws have established an eight-hour day on public works (1913); sought to protect employees against exploitation by company stores and boarding houses (1913); prohibited the bringing in of workers under false representations (1913); provided for a system of arbitration in labor disputes (1913); prohibited the payment of wages in nonnegotiable paper, and required the payment of wages at

least monthly and within 15 days after the end of the month (1923); placed a fee of \$500 per year on private employment agencies (1919); and required the payment of prevailing wages on public works (1931).

In addition to the above laws, all of which were enacted at local initiative, the Territorial legislature has been prompt in accepting the provisions of recent Federal legislation, which required approval of the Territory in order to be effective within its jurisdiction. Thus, in 1937, Alaska, in conformity with the Social Security Act, enacted laws establishing an unemployment-insurance system and a system of maternity and child welfare, as well as accepted the provisions of the Social Security Act relating to the public health. At the same time, it accepted the provisions of the Wagner-Peyser Act regarding public employment offices, and established a department of public welfare for the Territory.

From the above brief review, it would appear that in amount and in subjects covered the labor legislation of Alaska compares very favorably with that of the jurisdictions within the continental areas of the United States, and, with respect to time of enactment, was well in advance of many of the States. There is, however, always the danger of the legislation of a particular, and more or less remote, jurisdiction not keeping pace with the best thought and practice, and it would be highly desirable for Alaska to review its labor code with this in mind. Particular attention might be given to the subject of administration and enforcement.

With regard to the latter point, about the only published information available is that contained in the annual reports of the Governor and the biennial reports of the Commissioner of Mines. These are not very comprehensive on this point, except as regards mining, and in recent reports the Commissioner of Mines has indicated that his effective field of action is too limited. Thus, in his report for 1936, the Commissioner, after noting that the funds available for the field and office work of his department during the previous biennium had amounted to only \$11,400 per year, states that "such a sum is wholly inadequate to cover the cost of properly performing the duties assigned to this department, which is charged with the responsibility of administering all laws and disseminating all official information relating to the Territory's principal industry. The neighboring Province of British Columbia, the area of which is but little more than half that of Alaska, engages in its Department of Mines the services of 23 engineers, examiners, assayers, and inspectors, in addition to their clerical assistants, in rendering to its prosperous mining industry services of a similar type. During the first year of the past biennium the personnel of the department in Alaska was limited to the Commissioner of Mines and

one clerk. During the latter half of the year 1936 it became possible, as a result of preceding economies in expenditures, to engage the services of one associate mining engineer."

As far as information is available, there has never been any regular system of inspection established for the canneries and other productive enterprises except mining. There is no reason to assume that the absence of an inspection and enforcement system has had undesirable results. It may be, indeed, that the limited industrial development of Alaskan industries has made such a system unnecessary, just as it is evident that the vast area of Alaska, with its limited population, would make such a system very expensive. Neverthe-

less, in planning for the future development of Alaskan industries, it would seem highly desirable that careful consideration be given to the subject. The experience of the States has shown that in matters affecting labor conditions, as in those affecting most social conditions, it is much easier to prevent the development of undesirable conditions than to remedy them after they have become established.

Federal Agencies

In the past there has been an almost complete lack of contact between Alaska and the Federal agencies directly concerned with the welfare of labor. The most conspicuous exception perhaps has been the Bureau of



FIGURE 5.—Fairbanks, Alaska

OFFICIAL PHOTOGRAPH, U. S. ARMY AIR CORPS

Mines, which from time to time in the past, in cooperation with the Territorial Commissioner of Mines, has detailed a limited personnel for assisting the Commissioner in various forms of mine safety work.

The Federal Department of Labor has had little contact with Alaska, except through the local offices of the Immigration and Naturalization Service, and these have been concerned with specialized duties not immediately concerned with labor conditions and labor relations. The Bureau of Labor Statistics, at the time of the great gold rush around 1900, made a comprehensive survey of labor conditions in the gold-mining industry. Since then it has made no industrial or labor surveys and, because of the expense involved, has never been able to include Alaska in its regular labor and statistical surveys of employment, wages, cost of living, etc., although recently it has undertaken to include Alaska in a few of its inquiries where the information could be secured by mail.

The Women's Bureau has never been able to extend its special studies of employed women to Alaska, nor has the Division of Labor Standards been in a position to include Alaska in its field of operation. Not until the present year, and as an outgrowth of Alaska's acceptance of the maternity and child-welfare provisions of the Social Security Act, has the Children's Bureau been able to extend its services to Alaska. Also only during the present year, and as a result of Alaska's creation of a free public employment office system, has the United States Employment Service established any direct contact with Alaska.

The failure of the investigative and service agencies of the Department of Labor to include Alaska in their fields of operation has been due solely to lack of sufficient appropriations. The legal jurisdiction of the Department of Labor includes Alaska, and the Department has always been conscious of the importance of including in this work the outlying areas of the United States such as Alaska, Puerto Rico, and Hawaii, but the appropriations made by Congress have almost always been on the assumption that primary activities should be within continental United States.

All proposals and efforts, therefore, for developing the national resources and industrial life of Alaska, must give careful consideration to the employment and living conditions of the workers affected. Sufficient funds should be made available to the Federal agencies concerned with the social and economic welfare of the growing population to adequately minister to its needs. Particularly this is believed to apply to those agencies of the Government operating in the fields of public health, labor conditions, administration of justice, native affairs, child welfare, education, and community services.

Labor Conditions

Almost everywhere the wage-earning class forms the dominant portion of the population, and this is especially the case in Alaska where economic circumstances have not favored the development of a large middle group of small proprietors, professional workers, and salaried employees. With this in mind, all proposals for expanding industrial activities in Alaska should be examined in the light of existing and probable future labor conditions in the industries concerned. Alaska is in serious need of industrial development and of the resulting population increase, but, if the ultimate objective is the building of a strong commonwealth, experience in the older and more industrialized States shows quite clearly that the character and quality of new industry and of the new population is just as important as quantity.

The principal productive industries of Alaska are metal mining and salmon fishing and canning. Mining and fishing are essentially masculine employments. A large portion of the workers engaged in the salmon-canning industry are brought from outside the canning districts, and have been almost entirely adult males. Of the total of 27,752 Alaskans over 10 years of age reported by the census of 1930 as engaged in gainful occupations, only 2,854 were females, and probably less than a thousand of these were engaged in productive enterprises. Also, the existing industries are such as to make little demand for the employment of minors. As a result, the labor situation in the Territory is influenced primarily by the fact that the working population consists almost entirely of adult males, engaged for the most part in occupations requiring considerable physical activity and mobility, and living, to a very considerable extent, in rather scattered and often more or less temporary communities. This type of employment tends to discourage the building up of normal family and communal life. As has been indicated according to the census of 1930, there were, among the white population of Alaska, more than twice as many males as females, and among the native-born white males 15 years old and over less than 40 percent were married, as against approximately 60 percent for the similar population group in continental United States.

The salmon industry (including fishing and canning) is by far the greatest labor-employing industry in Alaska. The industry is well established and apparently is organized along very efficient lines. Its weakness, from the social standpoint, is that its season is very limited, and that a large part of its staff of operatives come or are brought from the States and remain in Alaska only for 4 or 5 months each year. Thus, although the census of 1930 reports less than 5,000 persons

engaged in fishing and less than 1,000 employed in the canneries, these figures apply only to the permanent residents; in the fishing and fish-canning seasons these numbers may be increased to some 20,000 or 30,000.

Such fluctuations most naturally result in special problems of labor, health working conditions, law and order, and other social and economic phases of group life. These facts, of course, do not mean that any effort should be spared to maintain the Alaska salmon industry, which is one of the greatest assets of the Territory. But they do suggest that at least equal effort should be made to reduce the evils of seasonality through such means as encouraging the development of complementary industries.

The various branches of metal mining, the second and only other major productive industry of Alaska, are also necessarily carried on under circumstances which may readily lead to unfavorable labor and social conditions. Mining is not in itself seasonal, but, because the demand for metals is tied up so closely with world forces and world prices, and because winter conditions often suspend the extraction of minerals in interior Alaska, the operation of the mines tends to be irregular, and as the mines are often located in more or less isolated communities the workers are peculiarly dependent on a particular enterprise for employment. These circumstances again militate against the establishment of permanent communities with well-developed social activities.

As regards wage levels in Alaska, the information, as already noted, is very limited, but such as exists does not indicate that the money earnings of the workers are out of line with those received in the States. Still less information is available regarding the real wages in Alaska, as there are no available data regarding prices and the cost of living sufficiently comprehensive to justify authoritative conclusions.

Needs of the Native Population

The native Indian population presents certain special labor problems. The Indian population in 1930 totaled 29,983, almost the same as the total number of whites. In part, the natives still hunt and fish and those along the Bering Sea and Arctic Ocean maintain herds of reindeer and to that extent are self-sufficient in their economy. Considerable numbers of natives, however, have sufficiently identified themselves with more or less settled industry to become part of the labor market, and this proportion will no doubt increase in the future.

The history of the contacts of an expanding and enveloping European civilization with indigenous populations has all too often been one of ruthlessness and tragedy but it is not believed that the development of Alaska can afford to go forward at the expense of one-half its population. Indeed it is believed that it is not necessary. The natives of Alaska have demonstrated their ability to enter the fishing industry as laborers, boat operators, proprietors, and as cannery owners. A sufficient number of them are employed in the mining industry, both lode and placer, to have indicated additional employment. It is of interest to note that some of the most important "strikes" have been first uncovered by natives. In those regions less hospitable from the standpoint of the incoming population the natives have through the centuries adapted their habits of living most perfectly; trapping in Alaska acquires the proportions of a major industry and in it many natives find a source of cash income; those along the Bering Sea and Arctic Ocean have acquired a certain amount of subsistence stability through the introduction of reindeer by the Federal Government in the period 1892-1902.



COURTESY WORKS PROGRESS ADMINISTRATION

FIGURE 6.—King Island Eskimo Child

LIBRARY

MAR 2 1944

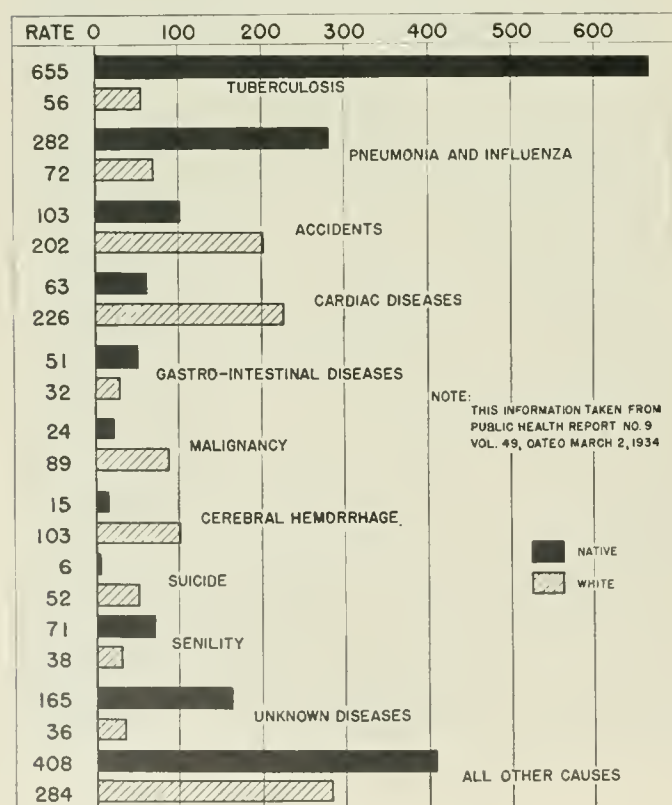
DEPT. OF AGRIC. ECON.

Any plan, therefore, which aids the natives of Alaska to further establish themselves in the salmon industry, which promotes those arts and crafts unique to the native groups, which insures the future of the wildlife supply, which protects the reindeer ranges or which prepares the natives for the variety of occupations, trades, and professions to be found in the major industries of the Territory is of utmost importance.

The economic aids established by the extension of the Indian Reorganization Act to Alaska (49 Stat. 1250), the protection of wildlife and the control of predators by the Department of Agriculture and the Alaska Game Commission, and the policy established by Congress by the enactment of Reindeer legislation (Public, 413, 75th Cong.) calculated to place the reindeer industry exclusively in native hands are encouraging. Nevertheless certain severe problems confront the native population as European civilization impinges more and more upon ancestral culture and rights. In the fishing industry, imported labor, lack of capital, and the acquisition of the more favorable fishing areas by other operators are serious factors. The disintegrating influence of liquor excesses, adverse living conditions, and more especially the problems incident to the control of disease are most conspicuous.

MEAN ANNUAL DEATH RATE PER 100,000 POPULATION

MORTALITY FROM IMPORTANT CAUSES AMONG NATIVE INDIANS AND ESKIMOS AND AMONG WHITES IN ALASKA DURING THE YEARS 1925-1930



PREPARED IN THE OFFICE OF THE NATIONAL RESOURCES COMMITTEE

FIGURE 7

Health Conditions Among Natives

A study of mortality among the native races of Alaska appearing in Public Health Reports of the United States Treasury Department, March 2, 1934,¹ points out that, although the white and native populations of Alaska are nearly equal, during the period 1926-1930 deaths reported among the native races were 2,767 and among whites 1,704. The largest death rate occurred in the age group under 20.

The study referred to shows that among the native Indians and Eskimos tuberculosis stands out far above any other cause of death, with a death rate of 655 per 100,000 for the whole native population of Alaska. In the southeastern division, where deaths were more completely reported, the rate is 888 per 100,000. The comparison between this rate and that for whites for the same areas is startlingly large. For whites the rate for the whole territory is 56 in comparison with a native rate of 655, and for the southeastern district 42 as compared with the native rate of 888. Tuberculosis is the cause of 35 percent of all deaths among the natives, a figure which does not vary greatly in the different divisions. There is even a suggestion of an increasing rate particularly in southeastern Alaska.

The following table shows the number and causes of deaths in the various judicial divisions.

Judicial division	All causes	Tuberculosis (all forms)	Pneumonia (all forms)	Influenza	Accidents	Cardiac	Cerebral hemorrhage	Malignancy	Gastrointestinal	Suicide	Senility	Unknown	All other causes
All Alaska:	2,767	982	240	183	155	95	23	36	77	9	107	248	612
Native.....	1,704	80	82	21	289	323	148	128	46	75	54	51	407
White.....	755	266	81	15	48	39	11	21	17	3	46	39	169
First division:	755	27	44	15	114	137	78	59	18	18	22	16	207
Native.....	775	257	70	35	44	27	7	6	40	3	25	69	192
White.....	83	1	1	0	16	21	11	9	1	3	4	3	13
Second division:	556	194	44	18	31	14	3	8	10	2	19	56	157
Native.....	546	40	23	4	106	99	36	33	23	36	15	14	117
White.....	681	265	45	115	32	15	2	1	10	1	17	81	94
Fourth division:	320	12	14	2	53	66	23	27	4	18	13	18	70
Native.....													
White.....													

AVERAGE ANNUAL DEATH RATE PER 100,000

Judicial division	All causes	Tuberculosis	Pneumonia	Influenza	Accidents	Cardiac	Cerebral hemorrhage	Malignancy	Gastrointestinal	Suicide	Senility	Unknown	All other causes
All Alaska:	1,846	655	160	122	103	63	15	24	51	6	71	165	408
Native.....	1,190	56	57	15	202	226	103	89	32	52	38	36	284
White.....	2,521	888	271	50	160	130	37	70	57	10	154	130	564
First division:	1,173	42	68	23	177	213	212	92	28	28	34	25	322
Native.....	1,785	592	161	81	101	62	16	14	92	7	58	159	442
White.....	1,163	14	14	0	224	294	154	126	14	42	56	42	182
Second division:	1,524	532	121	49	85	38	8	22	27	6	52	154	430
Native.....	1,234	90	52	9	240	224	81	75	52	81	34	32	265
White.....	1,701	662	112	287	80	38	5	3	25	3	43	210	235
Fourth division:	1,166	44	51	7	193	241	84	98	15	66	47	66	255
Native.....													
White.....													

¹ Later unpublished statistics reinforce the seriousness of the health problem among the natives of Alaska.

The number of deaths resulting from pneumonia and influenza is also high among the natives, due probably to lack of proper care during illness in the rigorous climate.

On the other hand deaths caused by accidents are much smaller among natives than among the whites, due chiefly to the fact that a great many white men are engaged in hazardous occupations, such as mining and seafaring occupations.

To cope with this serious problem the Office of Indian Affairs has only 7 hospitals with a total bed capacity for tuberculosis of only 32 which are all located at Juneau. The personnel of the medical service includes a medical director, supervising dentist, supervisor of nurses, 9 full-time physicians, 6 part-time physicians, 15 contract dentists, 30 field nurses, 20 hospital nurses, and 49 unclassified personnel, cooks, janitors, and attendants. The need for additional facilities and personnel is clearly indicated.

Education of Natives

For the education of the natives of Alaska some 100 schools are maintained. In many areas of Alaska a parallel system of Territorial schools has also been established. The major urge back of the establishment of Territorial schools appears to have been the desire to supply educational facilities to the whites of Alaska, distinct from anything which might be done for the natives. The shift in population which has occurred as mineral-bearing areas have been exhausted has resulted in the departure of the white population from many centers served by Territorial schools, leaving these institutions populated entirely by mixed bloods and with a substantial population of full-bloods. A good deal of thought has been given at various times to the possibility that a consolidation of educational services for the Territory might be desirable. There is no doubt but that such a move at this time would encounter strenuous resistance upon the part of the whites, possibly deepening antagonism between the races, with the possible eventual result that the amalgamation of the school population would be taken for granted. If these were the only considerations, it might be best that the native children suffer this intermediate period of strong racial antipathy in exchange for a possible later period of conditioned acceptance. On the other hand it is gravely to be doubted that the traditional American public-school program demanded by the white resident of Alaska who contemplates the ultimate return of his children to the States is remotely suited to the needs of the native child who does and should look forward to permanent residence in Alaska. It is the present objective of the Indian Service increasingly to gear its educational program to the needs of the natives of Alaska, assuming that they

will remain in Alaska. As a partial resolution to the present anomaly of a dual school system in certain areas where the population does not justify the expense, it has been proposed that the Indian Service assume responsibility for schools heretofore operated by the Territory in areas from which the whites have departed, and that in certain other areas where the full-blood population is exceedingly small, the Federal Government withdraw if the education of full-blood natives by the Territorial schools can be arranged. In general this proposal has met with the approval of the Territorial school officials, and steps are already being taken toward its realization. Aside from one or two areas where the mixed population is sufficiently large to justify the operation of local high schools, Alaskan communities are so small as not to justify an educational program beyond the elementary level. This means that a secondary vocational program, if it is to be carried on, must be operated at a limited number of centers on a resident basis. Several small orphanages, originally operated at various points in Alaska, have been closed, and today two vocational boarding schools constitute the sole advanced vocational centers. One of these is at Wrangell in southeastern Alaska and the other at Eklutna on Cook Inlet.



COURTESY WORKS PROGRESS ADMINISTRATION

FIGURE 8.—Diomedes Island Natives at home

A rapidly increased interest in secondary education has been manifest within the last few years. Wrangell, which started with an enrollment of 50 students and a capacity of 150, is today enrolling 170 students. Eklutna, with inadequate facilities for 110 students, is today enrolling 140. The greater portion of this Eklutna enrollment is from the Eskimo country and means that Eskimo children who will return to make a living in the northern area of extreme climatic conditions are transferred during their adolescent schooling to a mild climate on Cook Inlet totally at variance with their normal experience. While the Eklutna School offers many facilities for the education of native children to a more suitable economic life through the preparation of its students for a combined fishing and farming economy which might be successfully carried on at selected centers on the Kenai Peninsula, it appears desirable that in the immediate future a third resident secondary school be constructed in Alaska at some point in the Eskimo country, probably in the neighborhood of Kotzebue. Steps are already under way leading to the development of vocational programs at these secondary schools which will actually prepare the students for a more successful life in their native environment, and it is the intention of the Education Division of the Office of Indian Affairs to continue this emphasis in the development of these schools.

Education in Native Industries

With the complete taking over of the reindeer service by the Office of Indian Affairs and the elimination of white commercial interest established by Congress as a policy of the Government, it becomes important for education to make provision for the training of Eskimo herdsman, for the development of individuals sufficiently familiar with white economic enterprise to make a success of the existing native stores and to assist in the necessary adaptation of native economy to its contact with white economy. All of these facts but strengthen the inferences drawn from the number of Eskimo young people seeking advanced vocational training. The opportunity for such training must be established in the Eskimo area.

Experimental work with the revival and adaptation of native handicrafts indicates that a substantial market may be developed under careful guidance. The school at Nome has developed a successful adult skin sewing project involving some 50 women of the Nome settlement which has increased the popularity of the Eskimo parka and indicates the possibility that with proper stimulus a favorable market for this garment

may be developed in other parts of Alaska and in parts of the United States where winter sports have become popular. A small amount of attention devoted to ivory carving among the Eskimos also indicates that with attention a revival of fine carving may contribute to the cash income of the natives. In southern Alaska what has been accomplished by a revival and adaptation of wood carving and silver work is prophetic of what may be done with the southeastern Indian crafts. The Office of Indian Affairs has recently appointed a supervisor of craft work for the entire Territory with a view to cultivating craft work.

A progressive program for the replacement of many existing structures and for the erection of school buildings in a number of native centers heretofore without these facilities may be envisioned for the future. From every standpoint it is to be urged that generous provision for the construction needs of Alaska be made in the immediate future.

Federal Responsibility

The foregoing discussion when taken in conjunction with the discussions which follow concerning the control and development of natural resources is sufficient to indicate that the Federal government must assume an important role in the guidance of the social and economic future of the Territory. Although the Territory was granted a Territorial legislature in 1912 with legislative authority within prescribed limits and Territorial offices have been established for the administration of Territorial law, some 50 Federal agencies have direct jurisdiction in Territorial matters. The social welfare of the Alaska population, the administration of justice, law and order, public health activities, the care for the Alaskan insane, medical and educational programs for the natives of Alaska, standards of employment and conditions of labor remain primarily the concern of the Federal government. The administration of the natural resources, minerals, forests, public lands, aquatic resources, wild life, have been kept Federal prerogatives. The control of these basic resources, their use and ownership, gives the Federal government almost unbounded authority over the population thus dependent upon them and adds further responsibility upon the Federal government for the welfare of the citizens of the Territory. No further listing of Federal activities is necessary to demonstrate the fact that the agencies thus controlling important elements in the life of the Alaskan inhabitants need to be enabled to perform their functions with the utmost consideration of the present demands and of the future development and settlement of the Territory.

Importance

The value of a well-organized and well functioning weather service is recognized by all agencies that are interested in the economic development of the Territory of Alaska. Aviation, agriculture, grazing, forestry, water power development, placer mining, forest fire protection, and the conservation of wild life and salmon can be planned more intelligently if information on weather and climate is obtained from an adequate system of meteorological stations carefully distributed over the vast Territory.

An inventory of the natural resources of a country would be incomplete without including its climate, for climatic conditions, as much as topography, geographic position, and other economic aspects, have an important bearing on the occupation and development of a region. Climate is not only basic to land resources and to land use, but it affects man in many other ways—his housing, clothing, occupation, forms of government, and manner of living, all are influenced by the climate in which he dwells.

The relation of such climatic elements as temperature, precipitation, sunshine, and the length of the growing season to animal and vegetable life, and hence to man's occupancy of land, is too obvious to need special consideration. In a report to the President of the United States some time ago his Science Advisory Board aptly stated "In whatever way we think of the land, or whatever land it is that claims our attention, that land is conditioned by the sky under which it lies, by the climate which is proper to it." However, sometimes so little may be known generally about the climate of a region that false impressions become widespread; this appears to be true, to a greater or less extent, in the case of Alaska.

As dependent on air transportation as Alaska is now and probably ever will be, especially in its interior, its water transportation facilities are of great importance and must be protected. An adequate service designed to provide water craft with weather information and forecasts and storm warnings is essential. It also is of high importance that there be inaugurated a regular system of daily weather forecasts for all portions of the inhabited sections of Alaska; that such forecasts be issued at least twice daily and that they

be effectively broadcast by radio. Weather reports from all portions of Alaska and contiguous land and water areas will be required for the purpose. Reports from weather observing stations now in operation, from those located in Canada and Siberia and from the additional stations recommended in this report for aviation and general service to the public and to agricultural, commercial, and water navigation interests will provide ample data for an efficient service of this kind.

An adequate meteorological service is vital to safe and efficient aviation. Air transportation is destined to play an important part in the development of Alaska, where distances are great, topographical features rugged, and weather conditions extreme. A well-organized and well-functioning weather service is vital for the protection of lives and property when this form of transportation is used. Such a service requires a large network of observing stations with well-spaced upper-air observations and forecast centers at important terminals where airline operators and pilots can obtain the latest weather information, examine weather maps and upper-air charts and consult with meteorologists.

Rapid development on the important streams of Alaska indicates the necessity to establish a river and flood forecasting service. This should be comprised largely of snow and ice surveys conducted from a network of reporting stations located on the principal rivers of the Territory. The contemplated service will be highly important in the reduction of flood damage, to the navigation interests, and to the operation of control works when such becomes necessary.

Historical

The earliest meteorological observations were begun at Sitka by Russian missionaries in 1828. The meteorological work at Sitka was taken over by Russian Government officials in 1842 and continued until 1867 when the Territory was acquired by the United States. However, aside from this record and a couple of others of a fragmentary nature made at mission stations, there appears to have been no effort during the Russian occupancy to make systematic weather records.

Soon after the organization of the United States Weather Bureau under the Signal Corps of the Army, by Joint Congressional Resolution, February 9, 1870 (16 Stat. L. 369), weather observations were begun

¹Prepared by a group composed of J. B. Kincaid, Edgar B. Calvert, and Delbert M. Little, Weather Bureau; First Lieut. R. M. Losey, Army Air Corps. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

by the surgeons at several army-post hospitals. Thereafter a few additional stations were established, with 13 in operation by 1890, but these early records were made generally near the coast and no data became available for the interior until the 80's and then only fragmentary in nature.

After the transfer of the Weather Bureau to the Department of Agriculture in 1890 observational work was extended as rapidly as conditions permitted, and by 1920 weather reports were being received from 73 stations. However, in Alaska, as in the States, the bulk of climatological records are obtained through cooperation with interested persons who make observations without compensation for their service and, because of sparse settlement in most sections, limited communication facilities, and often lack of permanency in residence, it has been difficult in many cases to maintain continuity of records for a sufficient length of time for the data to be of material climatological value. The station mortality and observer turnover are extremely large. Current climatological records for Alaska have been printed in both monthly and annual summaries and earlier data, up to 1921, are summarized in considerable detail in Weather Bureau Bulletin W.

Forecasting activities in Alaska necessarily could not begin until it was possible to secure current daily observations from scattered places in the Territory by cable, telegraph, and radio. Local forecasts for Juneau and vicinity were first issued in 1917, and were extended later to the area traversed by the Alaskan railroad to Fairbanks and the Tanana Valley. In May 1919 Juneau was designated as the district forecast center.

The first observation obtained by radio was from Nome on November 1, 1907, followed by Eagle on June 24, 1909, Kodiak and Dutch Harbor on May 1, 1915, and St. Paul on August 8, 1915. Prior to these dates observations were secured regularly from places on or contiguous to the Seattle-Alaska cable. When the forecast service began in 1917 observations were available at Juneau daily or twice daily from 10 places in Alaska. These reports were cabled also to Seattle and distributed to the various forecast centers. They proved to be of incalculable value in connection with the forecasting service in the United States.

By the time that the service for airways was inaugurated in 1931 there were 13 such stations transmitting observations daily or twice daily. They, with an increased number of observations each day, have formed a fundamental source of data used in providing service to aviation since that time.

A limited service for aviation was established in 1931 by the Weather Bureau when Congress appro-

riated \$26,695 for this purpose. No increase has been provided since that time and the service is entirely inadequate for present operations. In fact, the flying hazards, due to unknown weather conditions, are very great when only sketchy weather maps and limited forecasts, with practically no upper-air information, are available.

Due to the undeveloped state of the Territory a river and flood forecasting service has not until now been considered necessary.

Current Activities

The Weather Bureau maintains a climatological service for Alaska with headquarters at Juneau. The section director at that station supervises the collection of weather reports, mainly obtained from cooperative observers without cost to the Government, consisting of daily records of temperature, precipitation, snowfall, and other weather elements. These are summarized and published in considerable detail for the several months and for the year as a whole, together with pertinent text description of conditions that prevailed during the respective periods. The section center has no printing facilities, and consequently the monthly publications are frequently considerably in arrears. The annual report for 1935 is in print and the monthly reports for the last half of 1936 and the early months of 1937 are in the process of printing.

The airway weather service in Alaska is under the supervision of the Weather Bureau Office at Juneau, assisted by the stations at Fairbanks and Nome. Scattered weather reports are collected by the three stations for flying operations and no regular forecasts for use of airline operators are issued. Upper-air winds are reported from the three stations twice daily.

A special research project has been undertaken at Fairbanks during the winters of 1936-37 and 1937-38. Funds for this project were allotted from the Bankhead-Jones Fund of the Department of Agriculture. The project, which ends March 15, 1938, is set up for the purpose of investigating the development of cold air masses in the far North which move southward into the United States and produce cold waves. During the first year of the work, airplane observations were taken twice daily for a 6 months' period, and during the second year of the project, both radiometeorograph and airplane observations were taken at Fairbanks.

A general forecast service comparable to that operated in the United States does not exist. Other than that provided for the air routes, the general forecasting is confined to daily predictions issued at Juneau for southeastern Alaska, the Gulf of Alaska, portions of the Tanana Valley, and local forecasts for Juneau and Fairbanks. Forecasts also are furnished to ships

north of Ketchikan. However, this latter is not a regular service and is given only occasionally and on special radio call from ships when north of Ketchikan.

Observations taken twice daily at 18 or 20 selected Alaskan stations are sent by radio to Seattle and thence distributed to the six principal forecast centers in the United States. This activity, while indirectly affecting the Territory, is an Alaskan product of great value and to it can be attributed prevention of loss of millions of dollars' worth of property in the continental United States because of warnings of cold waves which could not be issued with so much timeliness if weather reports from Alaska were not available.

Twice daily broadcasts of weather conditions prevailing in Alaska, the western States and in the Pacific, together with forecasts for the Pacific Ocean contiguous to those States, are made from the United States Navy radio station at Dutch Harbor. The forecasts contained in these bulletins are prepared by the Weather Bureau forecaster at San Francisco.

There has been no river and flood forecasting service conducted on Alaskan rivers although it is believed that such a service will be found desirable and feasible at this time.

Climate of Alaska

Lying north of the Pacific Ocean with a vast expanse of land to the east and separated only by Bering Strait from the larger land mass of Siberia to the West, the main portion of Alaska is covered during the winter by relatively high atmospheric pressure. Over the immediate water surface to the south there usually exists a trough of low pressure, with a west-east trend, commonly known as the "Aleutian Low." Through this pressure valley, so to speak, pass a great many of the cyclonic disturbances of the Northern Hemisphere in their west-to-east movement. Other disturbances originate in it and altogether it exercises a great influence on the weather of the Territory, as well as on that of the Canadian Provinces to the east and the northern half of the United States to the southeast.

The mountains of British Columbia, with their southeast-northwest trend, present somewhat of a barrier to the eastward movement of these barometric depressions, many of which stagnate in the Gulf of Alaska for days at a time, especially if the Pacific high-pressure area, lying far to the south, manifests a tendency to move northeastward over Oregon and Washington. In fact, after reaching the Gulf of Alaska a cyclonic storm may be forced to pursue a retrograde movement and actually to move northwestward.

Whether from a breaking down of pressure over the Arctic slope of Alaska, or from the northward thrust of the Pacific high, these Aleutian "lows" occasionally

take a northeastward movement, over Bering Sea, and advance toward the Seward Peninsula, or they may take a similar direction of movement farther east over the Yukon Valley. So long as the "lows" in winter pursue their normal track over the north Pacific and the Gulf of Alaska, fair and cold weather obtains over the interior valleys of the Territory, with relatively warm and rainy conditions over the southeast. When, however, they take a northeastward movement, the temperature of the interior moderates under the influence of southerly winds, and precipitation to a greater or less extent ensues. Occasionally, from some cause not yet definitely known, the Arctic "high" builds up to an exceptional extent; then northerly winds, attended by fair and unusually cold weather, prevail over nearly the entire Territory.

In the summer season, with the building up of pressure over the cooler waters of the north Pacific and the heating of the land surface of the interior, under the influence of the long days of high latitudes, the interior pressure is relatively low, the weather becomes warm, sometimes hot, with occasional rains.

Much of Alaska has unusually strong relief. Peaks 3,000 feet in height are common, while scores have elevations above 5,000 feet, and a number rise to 10,000 feet or more. Because of this and also its peculiar position with respect to the north Pacific storm track and close proximity to the Pacific Ocean, the Bering Sea, and the Arctic Ocean, the country has a highly diversified climate.

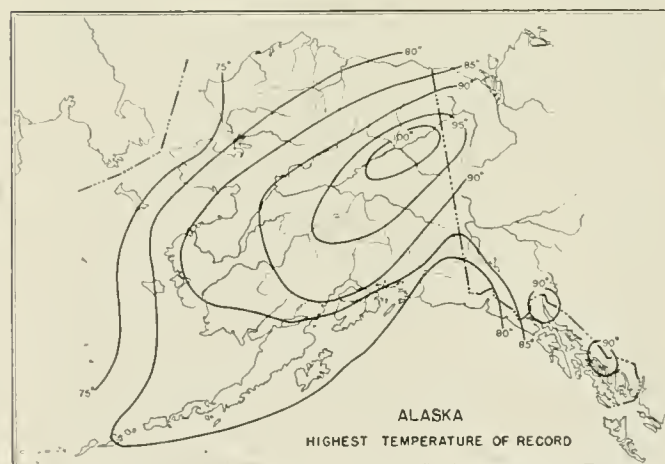
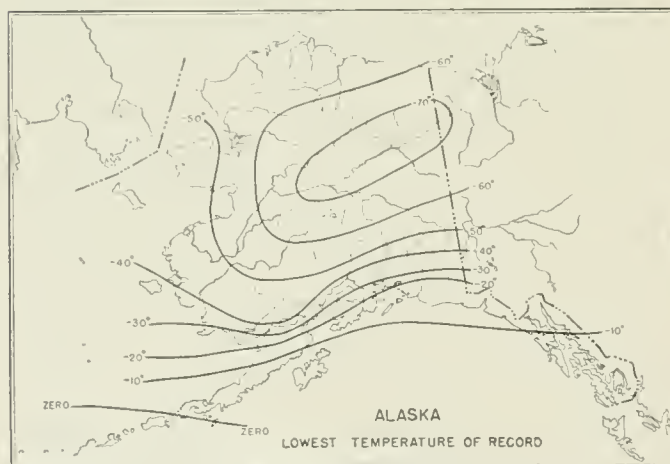
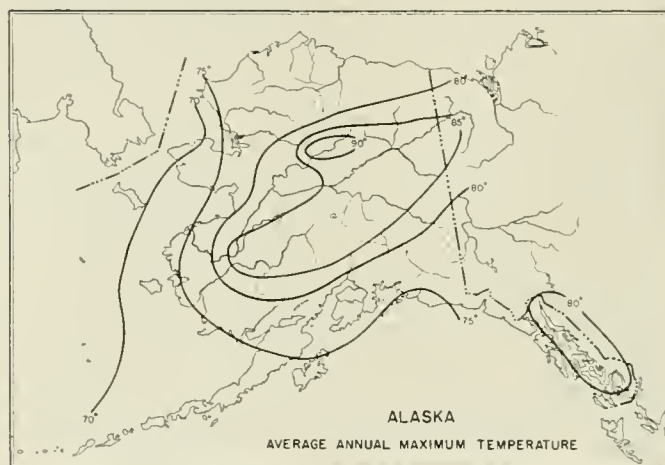
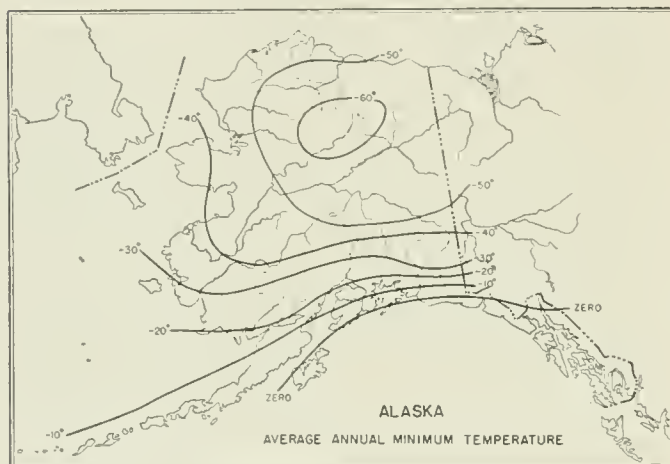
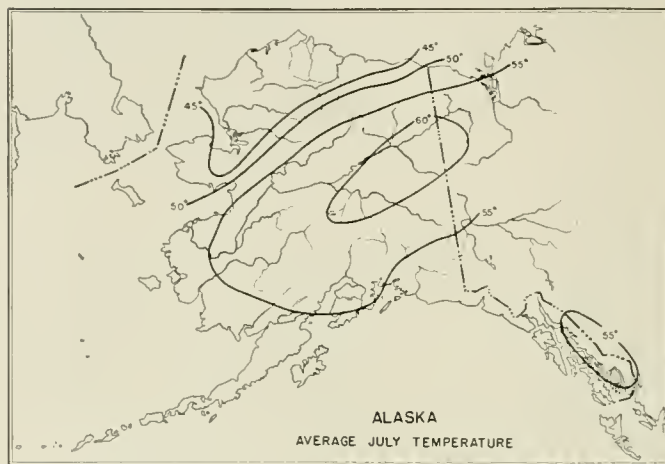
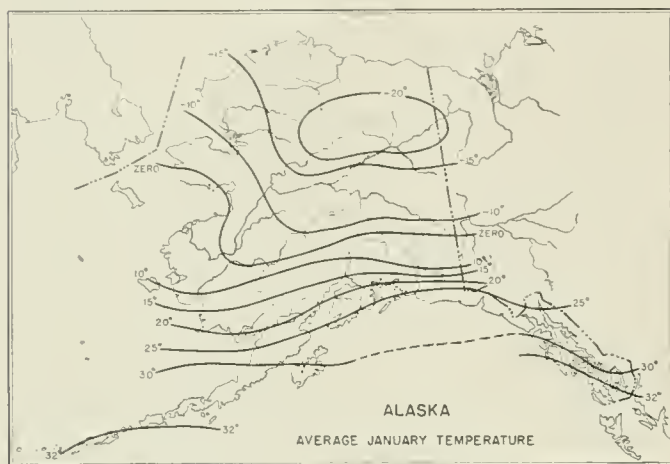
Less than a generation ago the popular conception of Alaska was a land of ice and snow, infested by polar bears and inhabited by a race of beings dwelling in snow and ice houses, and subsisting on blubber and the flesh of animals native to a frigid climate. Even today many people find difficulty in divorcing these preconceived opinions from their mind, and it is a surprise to them to learn that tropical daytime temperatures are recorded in Alaska every summer, and that along parts of the southern coast zero readings have never been observed.

The climate of different parts of Alaska varies greatly in both temperature and precipitation. In the extreme southeast, south, and southwest, the climate is relatively mild and decidedly equable, while the precipitation is heavy. In the more southern sections the temperature varies from a mean of about 32° in January, the coldest month, to about 51° in July, the warmest. The average January temperature compares to that in central Maryland, southern Illinois, and southern Kansas. However, to the northward winter temperatures become progressively more severe; extremely cold weather is frequent in the interior basin and the Arctic region. In the Yukon and Tanana Valleys the annual temperature range is pronounced, varying from an average of more than 20° below zero for January

in the coldest parts, to about 60° above in July, or an annual range of more than 80° , compared with a little more than 20° in the more southern sections. In the west, the Bering Sea area, the average January temperature ranges from 14° at Naknek to 3° at Nome,

with a summer range from 54° to 50° , respectively. On the Arctic coast the average annual range is from -18° in January to about 40° in July.

The average annual minimum temperatures range from 4° to 7° above zero in the extreme southeast and



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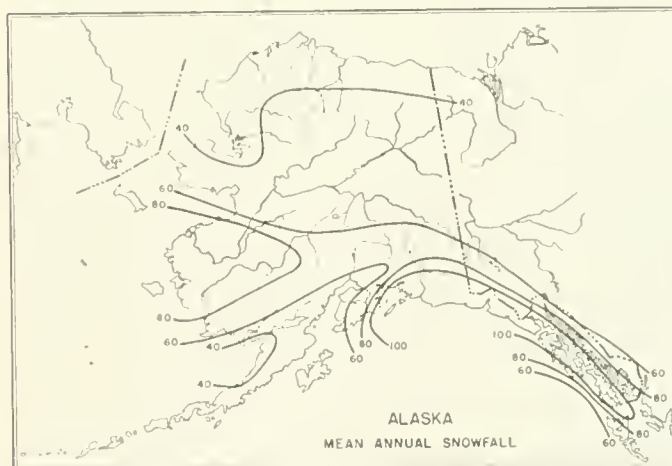
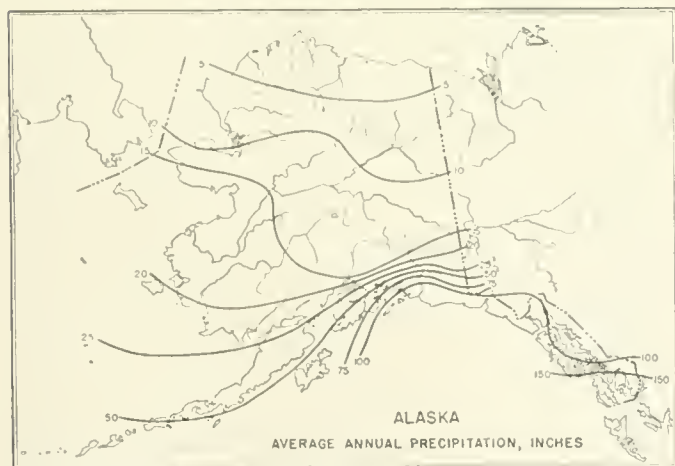
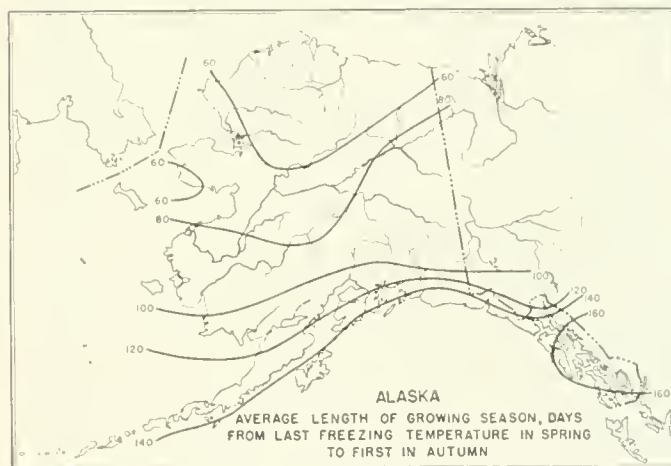
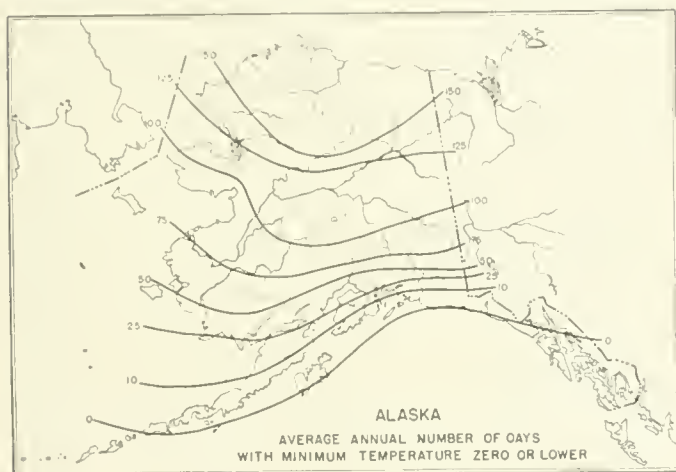
FIGURE 9

zero along the southern coast to -56° at Tanana and -64° at Allakaket, in the interior on the Arctic Circle. However, the average annual range of the maxima is smaller, increasing from 75° along the southern coast to 85° or 90° in the Yukon Basin. The highest temperatures of record range from 80° in the extreme south to 100° in the upper Yukon Valley, while the lowest of record vary from 5° above zero at Dutch Harbor and slightly below zero in the southeast to -76° at Tanana. It is of interest to note that the lowest temperature of record at Sitka, -5° , compares favorably with the low record at Meridian, Miss., of -6° , and Tallahassee, Fla., -2° . However, minima in the interior are considerably lower than at any place in the United States, the extreme of -76° at Tanana being 10° lower than the absolute minimum for the United States, -66° in Yellowstone Park, Wyo.

The average number of days annually with minimum temperatures zero or lower gives a good indication of the relative severity of a climate. In Alaska this ranges from only 2 days in 20 years at Ketchikan and

Sitka, and 6 in 20 at Juneau, to an average of more than a hundred days a year in the Yukon and Tanana Valleys. At Fort Yukon there is an average of 132 days a year with temperatures zero or below, and at Barrow, on the north coast, 170 days.

The length of the growing season, or the period between the last freezing weather in spring and the first in fall, has a basic relation to agriculture. In Alaska the growing season ranges from an average of 160 days along the southeastern coast and 140 days on the central Pacific coast to from 80 to 90 days in the central Tanana and upper Yukon Valleys. In the south this period of 140 to 160 days compares with the growing season in central lower Michigan, southern Minnesota, and central Nebraska, but in the interior valleys it is shorter than in any agricultural areas of the United States. However, the summer temperatures here are delightfully pleasant and, under the influence of prolonged daylight, vegetation makes rapid growth. This unusual length of the day compensates to a con-



PREPARED IN THE OFFICE OF THE NATIONAL RESOURCES COMMITTEE

SOURCE, U.S. WEATHER BUREAU

FIGURE 10

siderable extent for the shortness of the growing season, but at the same time there is much cloudy weather.

The variations in precipitation in Alaska are equally as marked as in the case of temperature. Along the southern coast rainfall is heavy, being in some sections considerably greater than for any locality in the United States. In the extreme southeast the average annual amount is more than 150 inches and is considerably over 100 inches in some central coast sections. However, inland from the coast precipitation decreases very rapidly, ranging generally in the interior basin from about 7 inches in the upper Yukon Valley to about 14 inches over Central Valley sections. In the Arctic area precipitation averages less than 5 inches a year.

Snowfall

Snowfall in Alaska has a relative distribution quite similar to that for the rainfall, being heavy along the Pacific coast, with decrease northward to a minimum along the Arctic coast. The average annual amounts vary from over 100 inches in southeastern sections of the Territory to between 80 and 100 inches in most of the Bering Sea area, 40 to 60 in the interior valleys, and to less than 40 in the Arctic region. Barrow is the only recording station averaging some snowfall for every month in the year. The Pacific coast, in general, has about 4 months without any snow, the Bering Sea coast 3 months, the interior 2 months, and the far north no month without at least a trace of snow. In the interior June and July are the months without snow, while in the same latitude along the Bering Sea July and August are generally snow-free, illustrating the effect of the cool sea in retarding the spring and early summer rise in temperature.

Sunshine

The possible daily hours of sunshine for different latitudes across Alaska vary from a maximum of 8 in the extreme south in December to from 16 in the south and 24 in parts of the interior and the north in June. However, the percentage of possible amount actually received is generally quite low. Very little sunshine data are available, but the figures for Juneau show that even in the long days of summer when the possible hours of sunshine are 17 or 18 a day the actual number is lower than at Boston. Boston has a yearly total of sunshine almost twice that of Juneau. Since observational data are very sparse, the best indication of the amount of sunshine is the number of clear and cloudy days. At practically all Alaska stations the number of clear days is seldom over half the total number, and often less than one-third; the greatest number of clear days is found in the interior, especially during the late winter and early spring months. Nearly all stations, except in the interior, average more

cloudy days than clear ones in the course of a year. The Pacific coast is the most cloudy part of the Territory, with an average of 200 cloudy days a year.

Records of foggy days are not available, except for Juneau, where the average is only 1 to 2 days a month. However, the pilot chart of the north Pacific shows for the Gulf of Alaska and the Aleutian Islands 15 to 25 percent of the days foggy during the winter season.

The Climate of Potentially Agricultural Areas

While weather records in general are not sufficient for a detailed study of Alaska, a few of sufficient length are available to afford a fairly good appraisal of the climatic characteristics of the three immediate potentially agricultural areas, namely the Matanuska Valley, the Kenai Peninsula, and the Tanana Valley. Data for Matanuska and Anchorage are fairly representative of the Matanuska Valley, and to some extent the Kenai Peninsula also. Seward, on the east coast of the Peninsula, is less representative because of topographic influence, but a short record is available at Kasilof on the west coast, nearer the agricultural section. The Fairbanks record is representative of the Tanana Valley area. A study of the data for these stations shows the following:

Matanuska.—A 19-year record (not wholly unbroken) shows an average January temperature of 12°, corresponding with the average for that month of 13° at Minneapolis, Minn., and 11° at Huron, S. Dak. The July average is 58°, which is lower than any agriculture section of the United States. The average annual maximum is 80° and the average annual minimum -25°, which may be compared with a similar record of -33° at Bismarck, N. Dak. The highest temperature for the period has been 84° and the lowest -36°, corresponding with an extreme low of -35° at Sioux City, Iowa.

The average date of the last freezing temperature in spring is May 24, and the first in autumn September 10, making an average growing season of 108 days. For the purpose of comparison the average length of the growing season for a few points in northern Minnesota are given as follows: Grand Rapids, 110 days; International Falls, 107; Meadowlands, 97; Roseau, 101; and Virginia, 108. In addition, the summer days are much longer than in northern Minnesota, there being about 20 possible hours of sunshine by June 15. However, summer temperatures are relatively low, the July average of 58° comparing with 64° at Duluth and 68° at Moorhead, Minn., and there is more cloudy weather. The shortest growing season at Matanuska for a 15-year period was 94 days in 1918, and the longest 140 in 1926. Freezing weather has occurred as late as June in one-fourth of the years and as early as the

latter part of August in 2 years of the period of record (1918 and 1922). The latest freezing weather of record in spring was June 13, 1933, and the earliest in fall August 26, 1918.

The annual precipitation averages 15.62 inches, ranging from 25.78 in 1930 to 11.25 in 1927. This shows unusually small variations from the average and consequently a dependable moisture condition. July is the wettest month, while June to September has more than half the annual rainfall. The greatest monthly fall was 7.55 in September 1925. The wettest summer (June-August) was in 1930, with a total of 11.01 inches of rainfall, and the driest in 1923 with 2.50 inches.

Anchorage.—The record for this place is fairly comparable with that for Matanuska, showing for a 20-year period (1916-35) a January mean temperature of 12° and a July mean of 57° . The average annual minimum is -21° and average annual maximum 77° , with an absolute low, -36° and absolute high, 92° . The average number of days with temperature zero or lower is 45 for the 20-year period. The average length of the growing season, computed as in the case of Matanuska, is 110 days, extending from May 23 to September 11, the longest growing season being 146 days in 1925 and the shortest 85 days in 1919. Freezing occurs as late as June in 15 percent of the years, but has occurred as early as August only once, August 26, 1918. In 1 year, 1934, no freezing weather was experienced until October 8. The average annual precipitation is 14.50 inches, slightly less than at Matanuska, with a seasonal distribution quite similar.

Seward.—Because of the location of this station, on the east coast with the Kenai Mountains as a background, the weather is quite different from that at Matanuska or Anchorage. The station does not even fairly represent conditions in the potentially agricultural area in the western part of the Kenai Peninsula. A 15-year record for Seward shows an average January temperature of 21° , about the same as the average for that month at Des Moines, Iowa, and a July average of 55° . The average annual minimum, -6° , compares with -25° at Matanuska and a like figure for Minneapolis, Minn. The lowest of record is -20° , comparing with -21° at Fredericksburg, Va., and -25° at Bartlesville, Okla. The average number of days with zero or lower is 6, corresponding with an average of 3 days at St. Louis, Mo., and 9 days at Albany, N. Y. Thus, it will be seen that the weather at Seward is quite mild. The average growing season, or period between the last freeze in spring and the first in fall, is 130 days, corresponding to eastern South Dakota, north-central Pennsylvania, and south-central Maine. In one-fourth of the years freezing weather does not occur before October. The shortest growing season of record is 107 days in 1917 and the longest 157 in 1924. Precipitation

is much heavier than at Anchorage or Matanuska, the 15-year average being 65.18 inches.

Kasilof.—Only fragmentary records are available for the western portion of the Kenai Peninsula, the best being 4 years' data for Kasilof (1930-33, and some data for 1934), which show conditions greatly different from Seward on the east coast. The average January temperature for these 4 years was 5° and the July average 58° , showing the winters much colder and the summers somewhat warmer than at Seward. The average rainfall was only 11.13 inches, the Seward record for the same 4 years being 62 inches. The average growing season shows only 84 days, compared with 108 at Matanuska and 130 at Seward. One growing season lasted only 60 days, in 1934, with freezing weather on July 10 and again on September 8. The longest growing season was 102 days in 1931. The highest temperature recorded was 79° in 1932 and the lowest -38° in 1933. If these records fairly represent what is currently considered potentially agricultural lands of the Kenai Peninsula, they strongly suggest that, climatically, the region is precarious for growing crops, particularly with regard to the period between the last freeze in spring and the first in fall.

Fairbanks.—A good record for Fairbanks represents very well the agricultural area of the Tanana Valley. For a period of 20 years, 1916-35, it shows as follows: Average January temperature -9° , compared with $+2^{\circ}$ at Devils Lake, N. Dak., and $+8^{\circ}$ at Duluth, Minn. The average July temperature is 60° , corresponding with Eastport, Maine, but 12° lower than St. Paul, Minn.; average annual minimum temperature -52° , the average annual maximum 87° ; absolute minimum -66° , which is exactly the same as the lowest of record for the United States proper, and absolute maximum 99° . The average number of days with zero or lower is 115, corresponding with a record for Bismarck, N. Dak., of 49 days and Minneapolis 31.

The average date of the last freezing weather in spring is May 30, and the first in fall August 23, giving an average growing season of 81 days, or 24 days shorter than Matanuska, and 26 shorter than Anchorage, but exactly the same as the 4-year record for Kasilof, on the west coast of the Kenai Peninsula. This average growing season of 81 days compares with 124 days at Park Rapids, Minn., and 107 days at International Falls. The shortest growing season was 24 days in 1922 when the last freezing weather occurred on June 13, to be followed quickly by freezing again on July 8. In that year all growing crops were killed by a hard freeze on August 30. The latest freeze of record was June 29, 1918, and the earliest July 8, 1922. Freezing in the spring occurs as late as June in 35 percent of the years and in fall as early as July in 15 percent, but holds off to as late as September in 35 percent of the

years. It should be borne in mind that, while freezing may occur in the interior valleys in any of the summer months, except where there is good air drainage, freezing temperatures in summer usually are of short duration and often do little or no damage.

The average precipitation is 11.83 inches. June and July, each with an average of 2.04 inches, are the wettest months, and 58 percent of the annual precipitation occurs in the 4 months from June to September. The greatest annual rainfall was 17.84 inches in 1935, and the least 7.73 in 1927. With the annual average as a base, rainfall in the Tanana Valley is much more dependable than in those parts of the United States with comparable normals. The heaviest monthly rainfall was 8.19 inches in August 1930. The greatest summer rainfall (June–August) was 11.36 inches in 1930, and the least 2.60 inches in 1927. The annual average snowfall is 51 inches, ranging from 116 inches in 1935 to 20 inches in 1926.

Deficiencies

The weather service in Alaska is not adequate even for present operations. It should be expanded to meet both present and future conditions and sufficient personnel and facilities provided. It is essential that the number of places from which weather observations are obtained be materially increased; that at least four daily observations be made available from a carefully selected network of stations; that observations of weather conditions aloft be secured from strategic points by means of pilot balloon observations, airplanes, or radio meteorographs, and that forecasts be prepared at least once daily for the principal air routes now in operation, for others that are to be inaugurated, and for general public utility. General forecast centers should be established at Juneau and Fairbanks, and, in addition, airway forecast centers should be maintained at Nome and Anchorage.

There is no regular storm warning service in Alaska. Occasionally masters of ships, large and small, do obtain by special means weather information and forecasts from the Weather Bureau Office at Juneau. There is much need for a systematic service of this kind. Storm warning displays (flags by day and lanterns by night) should be made at the principal ports. Weather reports are needed four times a day, or oftener under bad weather conditions, from numerous places along the waterways. In this work cooperation by the Coast Guard, Lighthouse Service, canneries and others having radio facilities would be sought. It would be the plan as a part of the service to ships to centralize weather information along the navigable waters at offices to which trained meteorologists are assigned, and to arrange for information as to existing weather at particular places being supplied on radio

request by vesselmen. With fast small boats operating in ever increasing numbers in the interior-passage waters of Alaska, much of which is narrow and has dangerous shore lines there is urgent need for those who operate such craft to know before starting a trip what the weather is at destination and intervening places. The centers of information probably would be located at Juneau, Ketchikan, and Anchorage.

Most of the activities of the Weather Bureau are inter-related. The same weather observations are utilized in practically all of them and in considerable part the same personnel, offices, and facilities are used. It also is the policy of the Weather Bureau in the interest of economy to seek cooperation with other government agencies who have activities at places from which weather observations are desired by having employees thereat serve as observers.

There is great need for complete weather observations and records from far-flung places which are not now obtainable because of isolation, sparse habitation, or lack of communications. In most of these places it would be necessary to erect suitable buildings, provide meteorological, radio, and other equipment and to employ observers and operators, etc. Attu, Diomedes, and places in the Arctic Circle are in this category. It would be prohibitive to incur the expense for weather reports alone. However, when other government agencies have need for service at such places cooperation and division of cost might bring about the desired results. This is a policy which government agencies should keep in mind.

Even with the improvements proposed in this report, the meteorological service in Alaska would not be nearly so complete as that in the States where hourly reports are provided from numerous stations along important airways. In order to compensate, as far as possible for the irremediable deficiency in observations, Alaska should be provided with an improved forecasting service for commercial, marine, and aviation interests comparable with that of district forecast centers and general and supervising airway stations in the States. The necessity for adequate airway forecasts is augmented because of the insufficient number of landing fields for plane landings. For example, on the route from Fairbanks to Wiseman, a distance of 200 miles, well within the Arctic Circle, there are no landing fields for a plane to make an emergency landing. With airplane landing fields relatively far apart, the need of weather information becomes of vital importance.

The network of communication channels in Alaska consists entirely of radio, with the exception of a few limited wire lines which parallel the Alaskan Railroad and the Copper River Railroad, and the remnants of abandoned Signal Corps lines now partially main-

tained by the Alaska Road Commission. The advantageous use of weather reports is dependent upon the ability of the Weather Bureau to organize meteorological observation stations and the effectiveness and expedition with which the observations can be transmitted, *hence adequate radio facilities are also vital in carrying out a program for aviation and general forecasting purposes.* For this reason it is very necessary that the service be organized with full cooperation by the radio stations and personnel of the Signal Corps, Navy, and Bureau of Air Commerce.

The weather service herein recommended will provide adequate protection for flying in Alaska. The organization would consist of airway forecast centers at 4 important airway terminals and the establishment of 7 additional upper-air sounding stations and 82 weather reporting stations to form an adequate network for the preparation of 6 hourly weather maps and forecasts. Many of the latter stations would be operated by personnel of the Signal Corps, Bureau of Air Commerce, and the Navy, while the remainder would be operated by part-time employees of the Weather Bureau, but all stations would be provided with a full complement of instruments.

In addition, climatic records based on systematic and reliable observations, which are becoming of increasing importance in all major fields of development, are entirely inadequate. Alaska, notwithstanding its extensive area and decided contrasts of climate, due to its topography, adjacent waters, and geographic location, has only 79 climatological stations, as compared with a total of 449 stations in the States of Iowa, Kansas, and Nebraska, the area of which is only about one-third of that of Alaska. It is from these records that a true picture of the climate of the Territory is obtained.

Because of these limitations in observing stations, together with the shortness of many of the records for which data are available, the climatic characteristics of much of Alaska are known only in a broad, general way, not in sufficient detail to afford an adequate appraisal of conditions. Many additional stations are needed, together with facilities for making current records available promptly in printed, usable form. The climatological service of the Weather Bureau should be enlarged and expanded just as rapidly as conditions permit.

Records of precipitation and temperature are of importance to mining, pulp mills, etc., in connection with water power and stream flow measurements. For example, the taxes collected by the Territorial Treasurer from the salmon industry in southern Alaska amounts to about 80 percent of the Territory's annual revenues. Yet, if precipitation is heavy in southern

Alaska during July and August, followed by dry weather in the fall, it is not uncommon to find many dead salmon in the streams that have not had a chance to spawn and have perished due to the lack of rainfall to maintain the water supply of the streams. The Bureau of Fisheries is making a study of the fisheries of Alaska and is also attempting to determine the effects of complete freezing of the streams on the survival of the developing spawn. Many other uses are also made of climatological and river observations, including correlations, etc.

The Weather Bureau should operate a river and flood service in Alaska. To do this it would be necessary to install complete facilities for conducting such a river and flood forecasting service. A number of reporting stations would need to be established at various points on the Yukon, Tanana, and other rivers. Two or more should be equipped to record stream flow and to transmit the record to the principal forecasting centers. It would also be necessary as a part of this project to inaugurate snow and ice surveys. Such surveys could best be made by utilizing airplane flights and air photography, and by establishing a short wave radio communication system.

The following is a tentative list of places in Alaska at which additional Weather Bureau activities are proposed.

Anchorage, Alaska (d), (j)	Juneau, Alaska (a), (b), (d), (j)
Bethel, Alaska (e)	Ketchikan, Alaska (f), (j)
Boundary, Alaska (f)	Nome, Alaska (d)
Cordova, Alaska (f), (j)	Point Barrow, Alaska (f)
Fairbanks, Alaska (a), (b), (c), (d)	Ruby, Alaska (e)
	Rainy Pass, Alaska (f)
Akulurak (k)	Farewell Mountain (h)
Amak (h)	Five Finger Light (h), (j)
Anvik (k)	Flat (h)
Annex Creek (h)	Fort Yukon (i)
Big Delta (i)	Fox Farm (k)
Broad Pass (h)	Gambell (h)
Bushby Island (k)	Good News Bay (h)
Cantwell (h)	Goose Island (k)
Cape Decision (k)	Guard Island (h)
Cape Hinchinbrook (h)	Haines (h)
Cape St. Elias (h)	Hawk Inlet (k)
Cape Sarichef (k)	Haycock (k)
Caribou Island-Skilak Lake (k)	Healy (h)
Chatanika (h)	Hidden Inlet (k)
Chignik (h)	Hoonah (k)
Chitina (i)	Hope (k)
Circle Hot Springs (h)	Hydaburg (h)
Cleary Summit (h)	Hyder (h)
Cooper Landing (k)	Iliamna (h)
Copper Center (h)	Jack Wade (h)
Dutch Harbor (j)	Jones Island (g)
Eagle (i)	Kaka (h)
Egegik (h)	Kanaga (j)
Evans Bay (k)	Kanakanak (h)
Excursion Inlet (k)	Kanatak (k)

King Cove (k)
 Kodiak (h), (j)
 Kogging (h)
 Kotzebue (h)
 Koyukuk (h)
 Lake Minchumina (h)
 Latitude 69 N. Longitude 162
 W. (g)
 Latitude 69 N. Longitude 154
 W. (g)
 Latitude 69 N. Longitude 146
 W. (g)
 Lawing (k)
 Lemesurier (k)
 Lucky Shot (h)
 McCarty (h)
 McClure Bay (k)
 McGrath (i)
 McKinley (h)
 Mary Island (k)
 Medfra (h)
 Mendenhall Glacier (k)
 Miller House (k)
 Mole Harbor (k)
 Mountain Climber (h)
 Nahesna (h)
 No Grub (h)
 North Nenana (l)
 Nulato (h)
 Ohogamute (h)
 Paxson (h)
 Peak Island (k)
 Petersburg (h), (j)
 Pilot Point (h)
 Platinum (h)
 Point Hope (h)
 Poorman (k)
 Port Alenander (h)
 Port Moller (k)
 Port Wells (k)
 Rapids (h)
 Red Bay (k)
 St. Lawrence Island (g)
 St. Mathew Island (g)
 Seldovia (h)
 Sealwik (h)
 Sentinel Island (h)
 Seward (h), (j)
 Shungnak (h)
 Skagway (h), (j)
 Sitka (h)
 Skwentna (h)
 Slana (h)
 Soapstone Point (h)

Stephens (l)
 Stevens Village (h)
 Stony River (k)
 Taku Pass (h)
 Talkeetna (i)
 Tanana (i)
 Tanana Crossing (h)
 Taylor (k)
 Teikel (h)
 Tenakee (k)
 Tetlin (h)
 Tigara (g)
 Tin City (Wales) (k)
 Todd (k)
 Tonsina (k)
 Tunnel (k)
 Unalaska (h)
 Unalakleet (h), (k)
 Unga (h)
 Valdez (h)
 Waterfall (k)
 Wiseman (h)
 Wrangell (h), (j)
 Yakataga Beach (h)
 Yakutat (h)

Meaning of Symbols

- (a) District forecast center.
- (b) Airway forecast center.
- (c) River forecast center.
- (d) Airway forecast center and radiometeorograph work.
- (e) First-order upper-air and river.
- (f) First-order upper-air.
- (g) Second-order station.
- (h) Second-order airway and special meteorological.
- (i) Second-order airway, special meteorological, and river.
- (j) Storm warning.
- (k) Climatological (cooperative).
- (l) River station.

AQUATIC RESOURCES¹

Introduction

The exploitation of the Alaska fishery resources may be said to have begun in 1878, 11 years after the purchase of the Territory from Russia, when the salmon-canning industry was established. Previously there had been some salting of salmon and cod both by Americans and by Russians and, of course, the various species of fish—salmon, herring, halibut, whitefish, cod, and many others—had formed one of the most important food supplies for the natives from prehistoric times. Previous to the spectacular development of the salmon-canning industry, however, the inroads made on this

natural resource must have been inconsequential. Thus the fisheries of the Territory were in practically a virgin state when Alaska was acquired.

The fur-bearing aquatic mammals had been ruthlessly exploited during the period of Russian occupancy and, unlike the fishery resources, they came under the control of the United States in a seriously depleted condition. Between 1786, when the Pribilof Islands were discovered, and 1834, it is estimated that 1,800,000 fur seals were killed for their skins. Due to imperfect knowledge of proper husbandry of the herd, the killings were not restricted to the males that could be spared without decreasing the birth rate. A crisis was reached in 1835, and restrictive measures were imposed by Russia prohibiting the killing of females. The herd gradually responded to the more favorable conditions afforded it, and in 1867 probably contained more than 1,000,000 animals, as compared with an estimated 5,000,000 in its unexploited state.

¹Prepared by a group composed of Ward T. Bower and Seton H. Thompson of the Bureau of Fisheries; W. C. Crouch, Bureau of the Biological Survey; Commander Wilfred N. Derby, Coast Guard; Leo D. Sturgeon, Department of State; Hugh S. Hanna, Bureau of Labor Statistics; F. G. Frieser, Maritime Commission; David Thomas, Office of Indian Affairs; and H. L. Sebantz, Forest Service. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above named group.



FIGURE 11.—Salmon Cannery at Loring

BUREAU OF FISHERIES

Like the fur seals, the sea otters were hunted vigorously during Russian ownership, and this valuable fur bearer was facing extinction in North America when Alaska was purchased.

Seeking new fields of exploitation, the American whaling fleet moved north into Alaskan waters about 1840. These operations, chiefly in Bering Sea and the Arctic Ocean, were intensive but short-lived. The discovery of petroleum in the United States and, subsequently, the substitution of steel for whalebone, by 1871 had made whaling in distant waters unprofitable, and the industry declined in importance before there was any apparent diminution of whales in Alaskan waters.

Other aquatic mammals had not been sought by the white men and hunting by aboriginal methods for food and clothing could not have reduced their numbers appreciably.

It seems apparent, therefore, that the aquatic resources of Alaska, with the exception of the fur seals and sea otters, were in a highly satisfactory condition when the United States assumed control in 1867.

Although the primary interest in Alaska at the time of its purchase centered about its mineral wealth and fur resources, there was an early movement to exploit the fisheries. The course of this exploitation has varied with almost every species sought commercially. In some cases adequate legislative protection was provided sufficiently early to cope with expanding operations; in other instances depletion became apparent before protective measures were instituted. At the present time, however, it may be said that the Alaska fisheries are in an extremely productive phase of development. Based upon our present knowledge of fishery management and with the adequate laws now in force authorizing the promulgation of protective regulations, there is reason to believe that this resource can be maintained at a high level of abundance.

The fur-seal herd likewise is in a satisfactory condition, having responded beyond expectations to protective measures. Although it may be some time before the maximum fur-seal population on the Pribilof Islands is attained, continued management along the lines followed for several years past will eventually result in complete restoration.

All killing of sea otters has been prohibited in the Territorial waters of Alaska and on the adjacent high seas since 1911, but this species is still very rare along much of the coastline it formerly inhabited. There are now a few colonies aggregating several hundred sea otters on certain isolated islands of western Alaska. It is evident, however, that this animal will require complete regulatory protection for many years to come.

Whaling has been carried on in a very limited way in Alaska, with modern methods, for many years.

This activity apparently has not materially reduced the number of these animals, and the protection now afforded by international agreement assures their perpetuation. The protection now afforded other aquatic mammals also, if continued in effect, will prevent their destruction.

Appraisal of Resources

Commercial Fisheries

Salmon.—Even before the purchase of Alaska from Russia in 1867 our fishermen occasionally resorted to southeast Alaska and prepared salted salmon. The salmon fisheries did not become important, however, until canning was begun in 1878; prior to that time the salmon resources were largely undisturbed. The growth of the salmon-canning industry, the first of Alaska's important fishing industries, was rapid. This growth is clearly indicated in table 1 and figure 12, showing the number of cases of salmon packed and the number of canneries operated since the inception of the industry.

TABLE 1.—Number of canneries operated, and pack of canned salmon in Alaska, 1878–1936

Year	Canneries operated ¹	Cases packed ²	Year	Canneries operated ¹	Cases packed ²
1878.....	2	8,159	1908.....	50	2,606,972
1879.....	2	12,530	1909.....	45	2,395,477
1880.....	1	6,539	1910.....	52	2,413,053
1881.....	1	8,977	1911.....	64	2,823,817
1882.....	3	21,745	1912.....	87	4,054,611
1883.....	6	48,337	1913.....	79	3,739,185
1884.....	7	64,886	1914.....	81	4,056,653
1885.....	6	83,415	1915.....	85	4,500,293
1886.....	9	142,065	1916.....	100	4,900,627
1887.....	10	206,677	1917.....	118	5,947,286
1888.....	16	412,115	1918.....	135	6,605,835
1889.....	37	719,196	1919.....	135	4,583,688
1890.....	35	682,591	1920.....	146	4,429,463
1891.....	30	801,400	1921.....	83	2,596,826
1892.....	15	474,717	1922.....	123	4,501,652
1893.....	22	643,654	1923.....	130	5,035,697
1894.....	21	686,440	1924.....	130	5,294,915
1895.....	23	626,530	1925.....	129	4,459,937
1896.....	29	966,707	1926.....	132	6,652,882
1897.....	29	909,078	1927.....	135	3,572,128
1898.....	30	965,097	1928.....	153	6,083,903
1899.....	32	1,078,146	1929.....	156	5,370,159
1900.....	42	1,548,139	1930.....	149	5,032,326
1901.....	55	2,016,804	1931.....	116	5,403,739
1902.....	64	2,536,824	1932.....	87	5,254,483
1903.....	60	2,246,210	1933.....	91	5,225,604
1904.....	55	1,953,756	1934.....	110	7,481,830
1905.....	47	1,887,801	1935.....	99	5,133,122
1906.....	47	2,219,046	1936.....	117	8,437,603
1907.....	48	2,169,870			

¹ Prior to 1906, canneries with 2 separate lines of machinery, but all under 1 roof, were enumerated as 2 canneries.

² Beginning with the pack of 1905 all cases have been reduced to the basis of 48 1-pound cans to the case.

In the early years of salmon canning, the catch for commercial use was small, and the runs were able to withstand the drain without evident depletion, in spite of the use of stream barricades and other improper and destructive fishing devices. The Congress of 1888–89 recognized the potential danger of depletion of the salmon runs and passed legislation limiting the methods of fishing in the Territory. By this enactment it was declared unlawful to erect dams, barricades, or



FIGURE 12

other obstructions in any of the rivers of Alaska which might impede the ascent of salmon to their spawning grounds, and furthermore, the Commissioner of Fisheries was directed to institute an investigation into the habits, abundance, and distribution of the salmon of Alaska, and the condition and methods of the fishery, with a view to recommending to Congress such additional legislation as might be necessary to prevent the impairment or exhaustion of those valuable fisheries, and place them upon a regular and permanent condition of production.

In accordance with this act, provision was made for undertaking the investigation in the following summer, 1889. A very comprehensive survey was planned, relating to the natural history of the salmon and the physical characteristics of their environment; the methods, statistics, and conditions of the salmon fishery; and the necessities and advantages of Alaskan waters for the artificial propagation of salmon. From the results obtained, it was expected to determine the

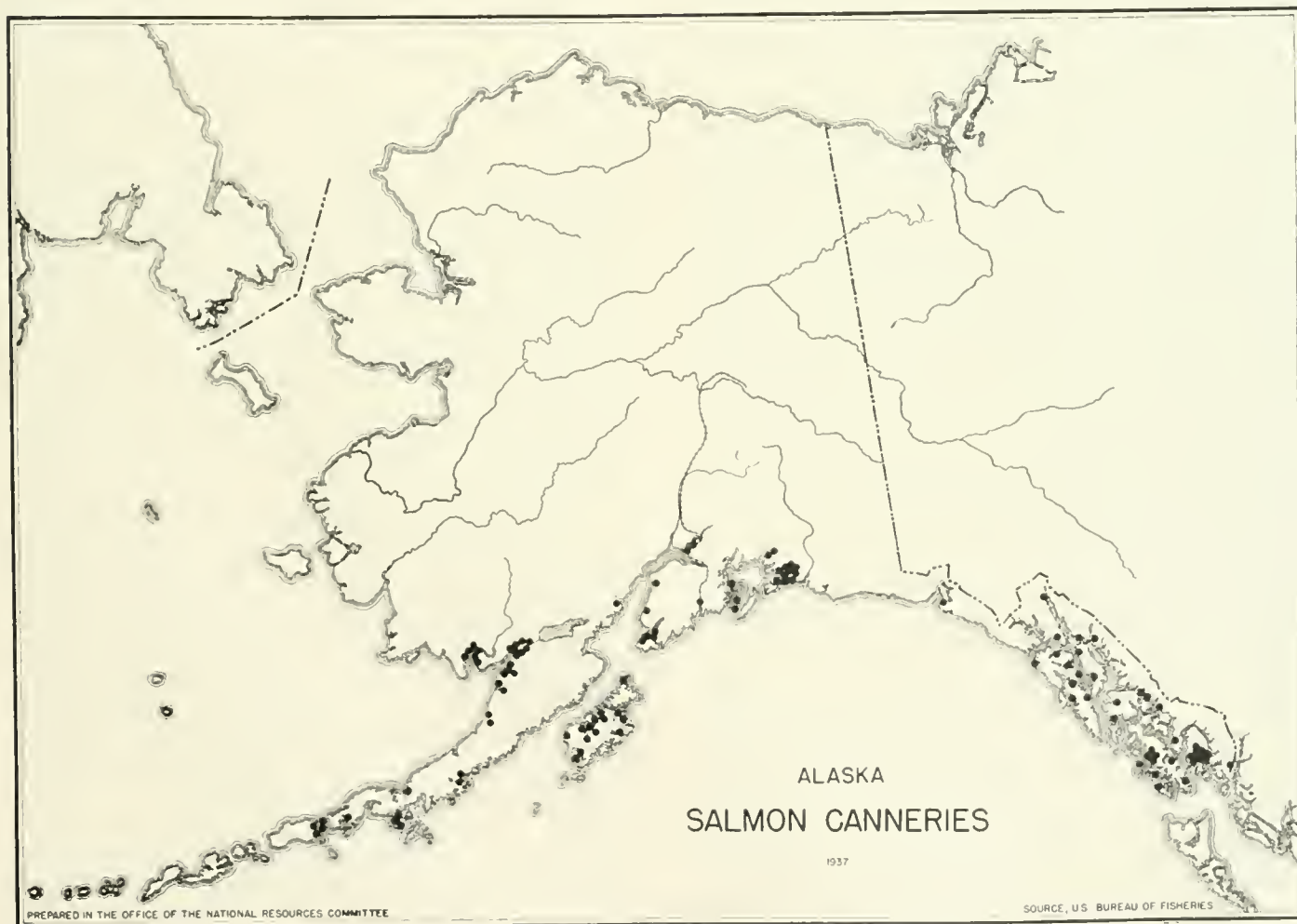


FIGURE 13

extent and causes of any injury that had been done, and the proper remedies to apply, whether through legislation or through the aid of fish culture.

This and subsequent investigations revealed the complexity of the life histories of the various species of salmon and more than ever emphasized the necessity for legislative protection of the fisheries. Most important were the studies which indicated that the five distinct species of Pacific salmon maintain independent, self-perpetuating colonies in each of the streams they inhabit. In order to maintain the salmon runs in each stream the spawning beds in that stream must be amply seeded each year.

By means of marking and liberating large numbers of young salmon, and by interpreting the markings on the scales of the salmon, the age at maturity was determined with certainty. Salmon of the various species were found to mature at ages varying from 2 to 7 years. After spawning but once all Pacific salmon die. The damage resulting from an inadequate seeding in any year is therefore not quickly repaired but requires several cycles of 2 to 7 years each, depending upon the species and locality, before the run is restored to its normal proportions.

A new Alaska fishery law was enacted on June 26, 1906, giving greater protection to the salmon and other food fish of the Territory. This act authorized the Secretary of Commerce to set aside streams and lakes as preserves for salmon spawning grounds in which fishing could be limited or entirely prohibited; to establish closed seasons; and to limit or prohibit fishing entirely within streams in which the natural production of salmon was jeopardized. Such departmental orders could be made only after extensive hearings and did not become effective until the next calendar year after they were issued.

The work of administering the rapidly expanding salmon fisheries was a complex problem, and many difficulties were encountered in protecting the fisheries under the laws and regulations in effect prior to 1924.

During the rapid growth of the salmon-canning industry from 1914 to 1918 at a time when war conditions demanded a maximum production of all food-stuffs, the Bureau of Fisheries was engaged in the enforcement of the inadequate fisheries laws of Alaska with limited personnel and facilities for inspection. Fish-cultural work had been undertaken to relieve the strain imposed on the salmon runs by the commercial fishery, but the propagation of salmon could not keep pace with the growth of the industry.

It was in this era of rapid expansion that the interest of salmon packers centered about the great runs of pink salmon in the sheltered waters of southeastern Alaska. In the period from 1910 to 1918 the pack of canned salmon in southeastern Alaska increased more

than 200 percent, and fear was expressed for the future of the industry.

In the years just prior to 1924 the situation in southeastern Alaska was unsatisfactory. The catch greatly decreased after the peak of production in 1918. These diminished catches, together with inadequate escape-ments of salmon to the spawning grounds, were accompanied by more intensified operations. Such obvious steady destruction of the Territory's most valuable natural resource could not be retarded under the fishery laws then in force.

As in southeastern Alaska, there was also a real scarcity of salmon in other parts of the Territory during that time, and it was similarly attributed to overfishing. Most of the packers, however, held, in the face of these facts, that the exhaustion of the salmon fisheries was an impossibility, and they vigorously opposed all efforts to curtail the fishery.

In 1921 it began to be appreciated that the condition of the salmon fisheries of Alaska was precarious in the extreme. Overfishing for many years had caused serious depletion. The runs in many sections were beginning to fail, and there was a unit of prophecy that the fisheries would be destroyed within a limited period unless restrictive measures were promptly put into effect.

The fishery law of 1906 was clearly inadequate. In 1922, however, as a temporary expedient, the President established by Executive order certain fishery reservations and placed them under the administrative control of the Secretary of Commerce, acting through the Commissioner of Fisheries. The regulations imposed under the authority of this order constituted an advance in the conservation of the salmon, and although authority was extremely limited and facilities were wholly inadequate, considerable progress was made in the direction of protection.

The first real authority for the regulation of the Alaska fisheries was conferred upon the Secretary of Commerce by the White law of June 6, 1924. Enactment of this law, which virtually gives the Secretary authority to say when, where, and how fishing may be conducted in the Territory, marked a turning point in the administration of the fisheries. From a state of declining abundance, the situation in respect to the salmon fisheries has been reversed, and after a period of gradual upbuilding this resource is now almost complete in its restoration. Evidence of this is contained in the salmon packs of recent years; that of 1936 was the largest in the history of the industry, while that of 1934 was second in size. Other packs of recent years similarly reflect the present healthy state of this fishery.

Cod.—The history of the Pacific cod fishery records the struggle of a few individuals and companies

against the long-established Atlantic coast fishery for this species, which, backed by wealth and a vast supply of raw product, has long commanded the American markets. In the North Pacific the question has been not so much that of being able to secure cargoes as of finding a market for the catch; a greater catch could be made if a market were available for it.

The first vessel to visit waters off the Alaskan coast for cod was the schooner *Alert*, from San Francisco, in 1864, and in 1882 the regular Bering Sea cod fishery was inaugurated. In nearly every year since, a number of schooners have operated on the Bering Sea banks, and for a number of years shore stations also were operated, chiefly along the south coast of the Alaska Peninsula and in the adjacent islands, for the prosecution of a winter fishery. At present the operations from shore are on a very small scale, by fishermen working either individually or in partnerships, chiefly in the Shumagin Islands region. The cod fishery has been carried on largely from vessels operating on the high seas of Bering Sea. The catches are salted and stowed in the hold of the vessel, and when a full cargo is obtained the vessel returns to its home port in the States. Usually only one trip is made to the banks in a year.

There appears to have been no decline in abundance of this species in territorial or offshore waters of Alaska. Fear has been expressed by cod fishermen in recent years, however, that extensive trawling operations by Japanese vessels in Bering Sea might seriously impair the productivity of certain offshore banks.

Halibut.—There are records of halibut fishing in Alaskan waters as early as 1879 by schooners operating from San Francisco. There was also some salting of halibut in the Territory in 1889, but this fishery did not attain importance until 1899. The first exploitation in Alaska was carried on by small schooners whose catches were shipped south on the regular freight steamers. The gold rush of 1898 provided this essential transportation link for the development of the fishery.

With transportation of the catches to market assured, halibut fishing expanded, but at first it was confined to the inshore grounds, which were quite limited in extent. The local Alaska fleet was supplemented by the Puget Sound vessels seeking protected waters in which to operate during the winter months. Declining abundance on the inshore banks and improved mechanical equipment in the fishing fleet, together with improvement in the means of preservation, turned attention to the deep-sea fishery, and an abundance of halibut was found on the banks from Forrester Island northward to the Gulf of Alaska. This fishery, unrestricted, grew in intensity until depletion had become so serious as to force international cooperation to protect it.

A convention between the United States and Canada became effective in 1921 and provided for a closed period of 3 months each year during which all halibut fishing was prohibited. It also provided for the appointment of an International Fisheries Commission, the duties of which were to make recommendations regarding the need for modification of the closed period, to make a thorough investigation into the life history of the Pacific halibut, and to make recommendations as to the regulation of the fishery deemed desirable for its preservation and development.

This treaty was remarkable in that it was the first effective one anywhere having for its objective the conservation of a threatened high seas fishery. It has served as a precedent for international cooperative control of sea fisheries where such is necessary. Success has been achieved under this and two subsequent conventions, and restoration of the halibut fishery of the North Pacific now seems assured.

Herring.—The first commercial use to which herring were put in Alaska was the manufacture of oil and fertilizer. A plant for this purpose was established on the site of an old whaling station at Killisnoo, on upper Chatham Strait, in 1882. This was the only herring reduction plant in Alaska until 1919, but expansion was rapid after that year. Although a few barrels of herring were salted in various localities prior to 1900, the pickled-herring industry may be said to have begun about that time at Petersburg. Operations were on a small scale until 1917, when the Bureau of Fisheries introduced into Alaska the Scotch method of curing herring. The resulting attractive pack, together with war prices, stimulated the industry. The catch of herring, which had never reached 40,000,000 pounds before 1918, amounted to 180,000,000 pounds by 1925.

The growing intensity of this fishery gave rise to fears of depletion, and in certain parts of the Territory there was ample evidence of reduced abundance. Scientific investigation of the herring was begun in 1925 to determine whether fluctuations in abundance were due to natural causes or to depletion, and, if due to depletion, how this condition might best be remedied. Facts were obtained on which to base sound restrictive measures, and regulations are now in force which will restore this fishery to a level of maximum productivity.

Clams, crabs, and shrimps.—The clam industry, primarily in central Alaska, and the shrimp industry, in southeastern Alaska, have been upon a well-established basis for about 20 years, and there has been a marked development in the packing of crabs in both these areas since 1931. In contrast with salmon operations, these industries are largely nonseasonal and are, therefore, of distinct importance to the residents of the Territory. It is probable that there will be a considerable expansion of shellfish production in Alaska.

Miscellaneous fisheries.—Trout, sablefish, rockfish, flounder, and “ling-cod” are used commercially in limited quantities. They do not support an independent industry but are handled incidentally in connection with other branches of the fisheries. Some of these species are used more or less extensively in the feeding of foxes and other animals on fur farms. Their further commercial utilization will depend upon market demands.

Whales.—Until after the turn of the nineteenth century, whaling off the Alaska coast, other than that participated in to a very limited extent by the natives, was carried on chiefly by a San Francisco fleet. Of the production by natives, only the whalebone and a small amount of oil entered into commerce. The first whaling station in Alaska to make use of all parts of the whale carcasses was that at Tyee in 1908. Products of the shore stations since then have included fertilizer, as well as oil. Although whaling stations have been established from time to time at several locations in Alaska, including small and short-lived operations on

Cook Inlet and at Nome for the utilization of beluga or white whales exclusively, there have never been more than four operated in any one year, and usually not more than two. Since 1922 no operations have been carried on in southeast Alaska. The industry is now confined to the central and western districts, one station being operated at Port Hobron in the Kodiak area, and one at Akutan in the eastern Aleutians.

Economic Importance of the Fisheries

The importance of the fisheries among the resources of Alaska is apparent from a comparison of the value of fishery products as prepared for market during the years 1880 to 1935, inclusive, which amounted to \$1,032,603,193, and the value of mineral products, next in rank, amounting to \$698,628,000 for the same period. Moreover, in contrast with the mineral resources, which are exhausted through use, the fisheries may be maintained at a high level of productivity by wise husbandry.



FIGURE 14.—Scow-Load of Salmon, Southeastern Alaska

BUREAU OF FISHERIES

The value of the fisheries to Alaska is indicated also by the amount of taxes on fishery activities, the Territory obtaining an annual average of more than \$700,000 in recent years, or nearly 80 percent of its total tax revenue, from this source. Under the act of June 26, 1906, the Federal Government collects taxes also on the fishing industry of Alaska at specified rates on the various products; these taxes now average more than \$200,000 annually.

The predominance of salmon in the Alaska fisheries is seen from the fact that salmon products alone were valued at \$916,262,896 during the period from 1880 to 1935, representing about 89 percent of the total fisheries output. Although fair quantities of salmon are sold fresh, frozen, and pickled, by far the largest part of the catch is used by the canning industry. From a small beginning in 1878, when 2 plants put up 8,159 cases of canned salmon, the industry increased until a maximum of 156 canneries were operated in 1929 and packed 5,370,159 cases, containing forty-eight 1-pound cans to the case or the equivalent thereof. The pack in 1929 was slightly larger than the average annual pack for the previous 5-year period. The all-time record output, however, was in 1936, when 8,437,603 cases were produced. The number of canneries operated in that year was 117, which indicates the tendency toward more economical and efficient operation through consolidation of effort. Although a few hand canneries are still engaged in the business, most of the plants are equipped throughout with modern machinery capable of large-scale production.

The value of salmon and other fishery products of Alaska for each year beginning in 1868 is shown in table 2 and figure 15. These data do not include the

value of cod products taken on the high seas off the Alaskan coast and landed in the States, nor do they include the value of halibut products of other than the Alaska fleet that were landed in the States. Table 3 shows the products of the Alaska fisheries for the years 1927 to 1936, inclusive, and the number of persons employed.

Besides their outstanding importance commercially, the fisheries of Alaska have a prominent place in the domestic economy, a considerable amount being taken for local use, the quantity and value of which cannot easily be determined. In this connection, not only the salmon, but trout, whitefish, and other species that have had little or no place in the commercial industry, are used extensively, so that the fisheries today, as in prim-

TABLE 2.—Value of fishery products of Alaska, 1868-1936

Year	Salmon	All other	Total
1868.....	\$16,000	\$332,668	\$348,668
1869.....	13,600	300,390	313,990
1870.....	14,400	291,278	305,678
1871.....	6,300	182,978	189,278
1872.....	9,000	175,080	184,080
1873.....	7,200	112,680	119,880
1874.....	11,200	123,662	134,862
1875.....	9,600	146,726	156,326
1876.....	14,400	221,471	235,871
1877.....	15,700	121,010	136,710
1878.....	41,272	157,160	198,432
1879.....	65,599	194,519	260,409
1880.....	52,517	150,033	202,550
1881.....	42,771	148,687	191,358
1882.....	118,245	162,216	280,461
1883.....	210,270	266,762	477,032
1884.....	249,612	269,213	518,825
1885.....	279,315	271,714	551,029
1886.....	469,944	294,022	764,866
1887.....	655,833	279,854	935,687
1888.....	1,321,845	144,313	1,466,158
1889.....	2,215,601	150,069	2,365,670
1890.....	2,210,124	183,938	2,394,062
1891.....	2,475,504	318,238	2,793,742
1892.....	1,565,019	270,491	1,835,510
1893.....	2,041,045	327,263	2,368,308
1894.....	2,235,380	301,472	2,536,852
1895.....	1,964,994	213,113	2,178,107
1896.....	2,966,519	213,325	3,179,844
1897.....	2,866,630	330,346	3,196,976
1898.....	3,182,457	315,072	3,497,529
1899.....	3,404,653	417,457	3,822,110
1900.....	4,917,065	463,229	5,380,294
1901.....	6,247,961	519,301	6,767,262
1902.....	7,851,534	544,770	8,396,304
1903.....	7,059,252	536,993	7,596,245
1904.....	5,967,577	586,008	6,553,585
1905.....	5,972,370	530,983	6,503,353
1906.....	8,166,373	488,272	8,654,645
1907.....	9,166,008	560,746	9,726,754
1908.....	10,671,651	768,664	11,440,315
1909.....	9,853,888	655,855	10,509,743
1910.....	11,501,105	1,173,485	12,674,590
1911.....	15,128,156	1,261,821	16,389,977
1912.....	17,144,672	1,732,808	18,877,480
1913.....	14,440,234	1,289,834	15,730,068
1914.....	19,558,529	1,684,446	21,242,975
1915.....	19,214,145	1,785,108	20,999,253
1916.....	24,054,838	2,101,721	26,156,559
1917.....	47,778,081	3,688,899	51,466,980
1918.....	53,514,812	5,630,047	59,144,859
1919.....	44,944,886	5,337,181	50,282,067
1920.....	36,641,836	4,550,288	41,192,124
1921.....	20,986,584	3,100,283	24,086,867
1922.....	31,566,257	4,604,691	36,170,948
1923.....	34,238,763	4,440,062	38,678,825
1924.....	34,793,504	5,495,760	40,289,264
1925.....	33,740,000	6,297,845	40,037,845
1926.....	48,178,995	6,490,887	54,669,882
1927.....	32,301,767	7,801,533	40,103,300
1928.....	47,487,763	7,057,826	54,545,589
1929.....	42,524,845	8,270,074	50,794,919
1930.....	31,532,488	6,146,561	37,679,049
1931.....	30,423,401	3,171,351	33,594,752
1932.....	22,609,811	2,419,109	25,028,920
1933.....	29,404,072	2,722,516	32,126,588
1934.....	38,749,475	3,212,818	41,962,293
1935.....	27,332,520	3,808,126	31,140,646
1936.....	46,496,222	3,959,050	50,455,272

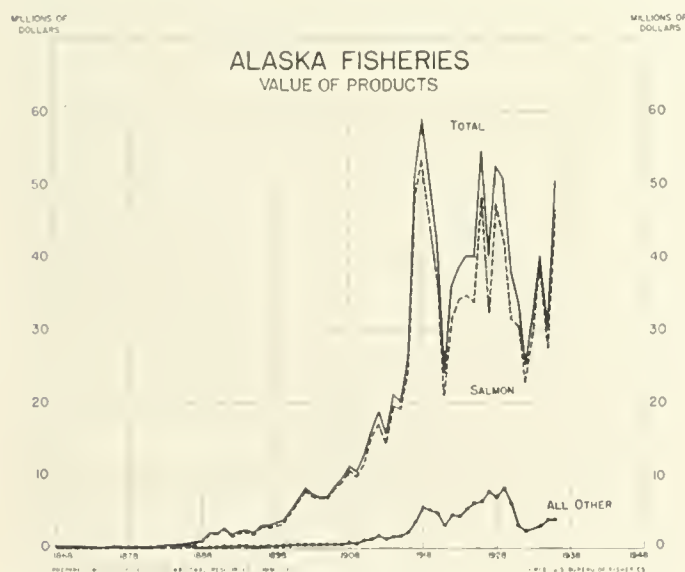


FIGURE 15

itive times, are one of the primary, direct means of livelihood for many inhabitants of this sparsely settled region.

TABLE 3.—*Products of Alaska fisheries as prepared for market and number of persons employed, 1927-36*

Year	Salmon fisheries			Herring fishery		
	Persons engaged	Products		Persons engaged	Products	
		Pounds	Value		Pounds	Value
1927.....	24,428	186,978,797	\$32,361,767	2,110	52,538,572	\$2,850,823
1928.....	27,236	308,691,203	47,487,763	1,992	63,047,653	3,098,457
1929.....	26,224	272,244,435	42,524,845	1,175	66,577,749	2,794,084
1930.....	24,288	259,143,338	31,532,488	1,413	68,144,048	2,133,677
1931.....	20,318	274,087,482	30,423,401	730	48,151,568	1,227,896
1932.....	17,767	267,876,081	22,609,811	819	57,860,907	1,173,158
1933.....	19,067	263,240,209	29,404,072	988	63,296,176	1,402,194
1934.....	23,679	372,585,487	38,749,475	885	70,406,218	1,603,024
1935.....	19,821	262,249,611	27,332,520	1,339	81,147,693	2,374,092
1936.....	27,596	424,451,160	46,496,222	1,111	74,188,120	2,075,632

Year	Halibut fishery ¹			Shellfish industries (clam, crab, and shrimp)		
	Persons engaged	Products		Persons engaged	Products	
		Pounds	Value		Pounds	Value
1927.....	1,365	34,491,283	\$3,805,088	531	1,245,804	\$383,396
1928.....	1,241	31,567,000	3,094,000	334	1,041,215	360,688
1929.....	1,253	37,456,998	4,422,605	331	1,412,907	476,833
1930.....	1,176	31,557,084	2,991,400	433	1,474,111	487,790
1931.....	946	20,425,633	1,352,687	532	1,688,975	538,970
1932.....	459	13,552,296	493,052	933	2,377,721	652,458
1933.....	569	14,068,911	726,362	931	1,935,668	504,300
1934.....	602	13,221,338	804,785	760	1,806,992	516,440
1935.....	425	9,805,680	607,845	787	1,772,707	489,809
1936.....	594	13,719,340	958,304	840	1,732,258	523,035

Year	Whale fishery			Miscellaneous fisheries (cod, ² trout, sablefish, etc.)		
	Persons engaged	Products		Persons engaged	Products	
		Pounds	Value		Pounds	Value
1927.....	326	11,475,950	\$622,412	112	2,736,339	\$139,814
1928.....	230	8,835,000	454,274	53	930,054	50,406
1929.....	233	8,925,189	502,081	67	1,328,482	75,371
1930.....	206	9,416,475	470,265	52	1,255,304	63,429
1931.....	114	7,664,143	91,133	51	1,081,730	51,798
1932.....	105	3,378,125	68,989	30	304,190	9,308
1933.....	210	9,353,875	251,005	35	500,958	20,671
1934.....	238	10,374,117	390,384	54	1,050,156	38,564
1935.....	223	8,813,875	331,461	10	1,001,409	35,996
1936.....				19	1,107,913	67,618

Year	Total		
	Persons engaged	Products	
		Pounds	Value
1927.....	28,872	289,466,745	\$40,163,300
1928.....	31,086	414,112,125	54,545,588
1929.....	29,283	387,945,760	50,795,819
1930.....	27,568	370,990,360	37,679,049
1931.....	22,577	345,435,358	33,594,752
1932.....	20,122	349,635,338	25,028,920
1933.....	21,695	346,480,047	32,126,588
1934.....	26,190	468,424,066	41,963,293
1935.....	22,620	366,351,217	31,230,646
1936.....	30,383	524,042,666	50,455,272

¹ Halibut products are the fares of the Alaska fleet, under which designation are included all American vessels landing more than one-half of their catch in Alaska or British Columbia ports rather than in the States.

² The cod figures do not include the offshore catch from waters adjacent to Alaska which are landed at ports of the Pacific Coast States.

The 30,000 Indians and Eskimos inhabiting Alaska equal in number the white population of the Territory. Fish is the most important article of food consumed by them, being in many instances the staple diet of entire communities throughout the year. It is also the chief food for the dogs used by the natives for transportation purposes and in operating their trap lines for furs.

Employment in the Fisheries

The number of persons employed in the fisheries of the Territory from 1905 to 1936, inclusive, is shown in table 4. The sparse population of the Territory and the highly seasonal nature of the more important fisheries, particularly salmon canning, require the importation each year of large numbers of fishermen, cannery workers, and others from the States for the period of operation. Local labor is employed widely in the fishing industry at the present time; and in the larger towns along the southern coast of Alaska the industry maintains a number of agencies through which employment is extended to residents of the Territory. The Alaska natives find employment chiefly in the salmon-canning industry, where, in recent years, about 5,000, or one-sixth of the total native population of Alaska, have been engaged.

The N. R. A. and the code of the canned-salmon industry did much to alleviate undesirable labor conditions which previously had existed, particularly the system of securing labor through contractors. Although the cost to the cannery operators under this system was the going wage, the laborers received very poor pay for their work, the difference being the contractors' share. This system has been abolished, and labor is now employed directly by the fishery concerns.

Labor organizations recently have assumed prominence in the Alaska fishing industry, and both shosmen and fishermen are strongly organized. The effect of union activity on the industry is not yet predictable.

It is believed that the development of industrial processing in Alaska in such a way that local labor would be given employment the year around, instead of for a few months during the active salmon-fishing season, would have a very beneficial effect on the Territory as a whole and foster a more rapid increase in the population there. If the canneries could be assured of an adequate labor supply among the local inhabitants, it would be possible to eliminate the expense of transferring workmen from the States, as well as reducing other costs connected with the seasonal shift of employees from one place to another.

From time to time protests are received from natives in Alaska against the importation each year of large numbers of Orientals and other workers from the States, who are employed in the Alaska salmon canneries during the operating season. These natives have

stated that Alaska Indians are fully qualified to perform the labor required but that they have been discriminated against in the matter of employment in the canneries. Quite naturally they feel that as residents of the Territory for many generations they should be given preference in the matter of employment, rather than that preference should be shown to residents of the States who come to Alaska only for the salmon-canning season. As the original inhabitants of the Territory they also feel that they have a prior claim on the fish and other natural resources there.

TABLE 4.—*Employees in Alaska fisheries, 1905-36*

Year	Number employed	Year	Number employed
1905.....	11,467	1921.....	15,070
1906.....	12,357	1922.....	21,971
1907.....	12,752	1923.....	25,246
1908.....	13,337	1924.....	25,194
1909.....	12,588	1925.....	27,685
1910.....	15,620	1926.....	28,052
1911.....	17,932	1927.....	28,872
1912.....	24,263	1928.....	31,086
1913.....	21,721	1929.....	29,283
1914.....	21,200	1930.....	27,568
1915.....	22,462	1931.....	22,577
1916.....	23,994	1932.....	20,122
1917.....	29,491	1933.....	21,695
1918.....	31,213	1934.....	26,190
1919.....	28,534	1935.....	22,620
1920.....	27,482	1936.....	30,383

In southeastern Alaska, Annette Island and the adjacent waters have been set aside for the exclusive use of the Metlakatla Indians and such other natives as may join them. These Indians, through the Secretary of the Interior, lease fishing rights in their reserve to a cannery operator for periods of 5 years, and receive a considerable portion of the income under the provisions of the lease. For the season of 1936 the Indians of this community received \$117,000 as their share of the profits from the operation of the cannery. In addition, they received approximately \$75,000 as wages for working in the cannery and from sale of fish to the cannery.

The Indians of Tyonek, on Cook Inlet, also have leased fishing rights adjacent to their village to cannery operators for a number of years and have received a considerable income therefrom.

Under the Indian Reorganization Act (formerly known as the Wheeler-Howard Act) the Office of Indian Affairs has under consideration recommending to the Secretary of the Interior that large areas of water, as well as land, be set apart as fisheries reserves for the exclusive use of the Indians, and that loans be made to the Indians for the operation of salmon canneries within these reserves. This has particular reference to southeastern Alaska and Cook Inlet, and may be extended to western and northwestern Alaska. If these plans work out successfully the economic condition of the Alaska natives should be greatly improved, and

the Federal Government would be relieved of the expenditure of large sums of money for the relief of destitution among the natives.

Game Fish

The fisheries of Alaska have gained recognition largely because of their commercial importance, but there are large numbers of game fish native to the Territory. In a setting of natural grandeur are innumerable lakes and streams, and practically each one supports a population of one or more species of native game fish. In no other part of this Nation do such recreational opportunities exist.

Marine game fish also are widely distributed over the entire southern coast of Alaska, and most species may be taken at any point along the main routes of steamer travel. Nearly every dock or float affords the marine angler an opportunity to try his skill. Among the species sought are the chinook, or king salmon, and the silver, or coho salmon, found along the coast, with the center of abundance in the inlets and channels between the numerous islands of southeastern Alaska.

Usually greater opportunities for game fishing are offered at some distance from the more settled sections of the coast. In the streams and lakes of Alaska there are at least three species of trout of the genus *Salmo*, one of the genus *Cristivomer*, and one of the genus *Salvelinus* that are indigenous. Grayling and whitefish also are abundant in certain localities. In addition, the eastern brook trout has been introduced and is now thriving in certain formerly barren lakes of southeastern Alaska. These species, together with numerous salt-water fishes, offer extremely diversified possibilities to the angler in Alaska.

Regulations were promulgated in 1936 and have been continued in effect since then, to assure protection of trout, other than the Dolly Varden, in Alaska. Under these regulations commercial fishing is prohibited in all streams and lakes of the Territory, and a limit is placed on the daily catch by any angler and on the number of trout in his possession at any time.

The Dolly Varden is an extremely predacious species, following the salmon runs to the spawning grounds, where large quantities of both eggs and fry are consumed. As many as 300 small salmon have been found in the stomach of one Dolly Varden trout. In the remote regions of Alaska these predators are destroyed, while in the more populated sections it is believed that unrestricted angling will satisfactorily reduce their numbers.

The introduction of game trout into many barren lakes and streams would further increase the opportunities for game fishing without interfering with the salmon industry.

Current Activities and Functions

Fisheries

Legislative authority.—The present work of protecting the fisheries of Alaska is based upon the acts of June 14, 1906, June 26, 1906, June 6, 1924, June 18, 1926, February 28, 1929, April 16, 1934, June 28, 1937, August 2, 1937, and August 14, 1937, together with presidential proclamations, Executive orders, and the fishery regulations of the Department of Commerce. The act of June 14, 1906, prohibits aliens from fishing in the waters of Alaska except when they are employed by American operators. With the exception of the act of June 28, 1937, giving effect to the convention between the United States and Canada for the preservation of the halibut fishery of the Northern Pacific Ocean, the acts enumerated above are concerned with the protection of the salmon and other fisheries of the Territory.

These acts prevent commercial fishing in streams, with certain exceptions; prescribe weekly closed periods during which all fishing is prohibited; establish the policy that there shall be a 50 percent escapement of salmon to the spawning grounds; refer to the establishment of private salmon hatcheries, the methods of handling fish products, the making of annual reports, the establishment by the Secretary of Commerce of areas in which fishing may be limited or prohibited; authorize the Secretary of Commerce to issue regulations further limiting the time, place, and method of fishing; and provide penalties for violations.

Regulations.—The Alaska fishery regulations, supplementing the provisions of the general law, are based upon biological and statistical studies. Biological investigations have provided information as to the age at maturity, routes of migration, independence of spawning populations, and the returns to be expected from salmon escapements of known size. Statistical studies have indicated the abundance of salmon and the need for regulatory action. Studies of other species similarly have indicated the need for protection and have suggested the most desirable form of regulatory action.

The operation of weirs for counting the number of salmon that ascend particular streams to spawn provides a means of regulating the commercial catch to assure an adequate escapement of brood fish and furnishes information of value in connection with scientific studies, especially with reference to their practical application in the forecasting of the probable size of the run at the end of the succeeding cycle.

The flexible nature of the Alaska fishery regulations permits the prompt meeting of unforeseen fluctuations in abundance, common in all wild life resources. The regulations can be relaxed to permit greater commer-

cial utilization of salmon and other species when the runs are above expectations, and, conversely, when it develops that they are less abundant than anticipated, additional restrictions may be imposed by supplemental regulations.

Patrol and related activities.—Throughout the commercial fishing season a patrol is carried on by the Bureau of Fisheries with 14 vessels and numbers of small boats and launches to enforce the laws and regulations for the protection of the fisheries. Airplanes have been used with much success in recent years in preventing violations of the regulations. They are very useful in covering the many hidden inlets and inside closed waters which are particularly tempting to poachers because of the schooling of large numbers of salmon preparatory to ascending to the spawning grounds. The stationing of guards at the mouths of streams during the runs of salmon in the summer months is an important means of protecting this fishery.

Fishing areas, especially in offshore waters, are patrolled by Coast Guard vessels to observe the extent of fishing and to detect violations of American fishing rights. The Coast Guard also renders medical and general assistance to fishing interests in Alaska.

The reclaiming of spawning areas that have become inaccessible to salmon by reason of an accumulation of debris from slides and log jams is an important adjunct to the Bureau's regular patrol duties. The work of improving conditions for natural propagation includes also some destruction of predatory trout that feed upon the salmon eggs and fry. Most of this work is carried on in the important Bristol Bay area, where bounties on predatory fish taken by bona fide residents are paid from funds provided by the Territorial legislature and the salmon packers, amounting to a total of about \$15,000 annually. The operation of salmon hatcheries in Alaska, carried on for a number of years both by the Government and private companies, has been discontinued because natural propagation at the present time is adequate to maintain the salmon runs.

Outlook for future development.—It is readily apparent that man is the greatest present menace to the perpetuation of the great salmon fisheries, both directly from an undue drain on the runs by overfishing, and indirectly through destroying environmental conditions on which the existence of the fisheries depends.

Heretofore the problem of maintaining Alaska's salmon has been concerned chiefly with regulating the direct operations of man in exploiting the resource. Under the fisheries act of June 6, 1924, as amended, which empowers the Secretary of Commerce effectively to control commercial fishing to assure an escapement sufficient for seeding the spawning beds, man's exploi-

tation has been curtailed in the interest of the future supply, and the beneficial results are seen in the new levels of production attained in recent years.

With the advance of industry and the growth of population in the Territory, new problems of conservation will be presented, just as they have arisen in the States, where once-plentiful supplies of anadromous fishes have been greatly reduced, in many places to the point of extinction. For this reason it is of the utmost importance that all developmental projects now under consideration be carefully regulated with a view to preventing any detriment to the fisheries. Deforestation, establishment of power projects without adequate fishways, pollution of waters by city sewage and waste from manufacturing plants, all would mean an irreparable loss of salmon and other valuable fish.

In considering the possibilities of further development of the fishing industry of Alaska, it is believed that the chief expansion must come through utilization of species, such as sablefish, pollock, whitefish, smelt, greenlings, rockfish, and flounders, which heretofore have been little used commercially because major attention has been given to the more abundant and better known salmon, halibut, herring, and cod.

Fishery byproducts could be increased by the general utilization of waste at salmon canneries, through development of more satisfactory reduction equipment, as well as a purifying system, to enable the profitable recovery of oil and meal. In this connection, technological studies are now being made by the Bureau of Fisheries which will be of benefit to the industry in Alaska, as well as in the States.

Other possibilities for consideration are (1) the preparation of special products, such as canned smoked salmon, caviar, and other delicacies which command relatively high prices in the American market and which are now almost entirely imported from foreign countries; (2) assistance in the selection and introduction of aquatic species, such as the oyster, in waters suitable for their development; and (3) additional studies and experiments with a view to increasing the production of clams, crabs, shrimp, and other species, particularly from the standpoint of furnishing employment to local labor during periods in which the salmon-canning activities are at a standstill.

Whales

Legislative authority.—Prior to 1936, whaling in Alaskan waters was unrestricted. On May 1, 1936, an act was passed to give effect to the convention concluded at Geneva on September 24, 1931, and subsequently ratified by the United States and 25 other countries for the regulation of whaling. In addition to restricting their capture and requiring that the fullest possible use be made of all whales taken, this act

provides that whaling licenses must be obtained annually from the Secretary of Commerce for each vessel engaged in the taking of whales and for each floating reduction ship and shore station used in the processing of whales, the fees for which are fixed at \$1,000 for each processing plant and \$250 for each vessel in excess of two engaged in the taking of whales in connection with any such plant. It is also provided that enforcement of the act and regulations thereunder shall be primarily by the Coast Guard and the Bureau of Customs.

Regulations.—Joint regulations of the Secretary of the Treasury and the Secretary of Commerce concerning whaling were approved by the President on October 9, 1936. The chief restrictions of whaling as provided therein are the prohibition of the capture of any right whale or gray whale and of any calf, suckling, or immature whale, or of any female accompanied by any immature whale of the balcen or whalebone whales, which include, among others, the right, gray, sei, blue, fin, and humpback whales and least porquals. Certain exceptions are made in regard to the taking of whales for scientific purposes under special permit by the Secretary of Commerce, and to whaling carried on by natives or Eskimos who are not employed by others nor under contract to deliver their whaling products to any third person.

Fur Seals

Legislative authority.—The activities of the Federal Government in connection with the Pribilof Islands fur-seal herd are authorized by the following laws: Act of April 21, 1910, and the act of August 24, 1912, giving effect to the convention of July 7, 1911, between the United States, Great Britain, Japan, and Russia.

By the international agreement of July 7, 1911, the taking of fur seals in the North Pacific Ocean and Bering Sea is prohibited, except under certain limited conditions by Indians and other aborigines dwelling along the coast of North America; and the killing of seals on the Pribilof Islands, the only place where they come ashore, is carried on by the United States Government through the Bureau of Fisheries.

Extent of operations.—As a result of curtailment of pelagic sealing, or the taking of seals at sea, and scientific management at the islands, whereby surplus males of a certain age group are selected for killing, the fur-seal herd has been built up from approximately 130,000 animals in 1910 to about 1,800,000 in 1937. During this period upward of 750,000 fur-seal skins have been taken at the islands, of which 15 percent, either in skins or in proceeds of sale, have been delivered to Great Britain (or the Dominion of Canada), and a like amount to Japan, as their shares under treaty provisions. Table 5 shows the number of ani-

nials in the herd and number of skins taken from 1910 to 1937, inclusive.

TABLE 5.—*Pribilof Islands fur-seal herd, 1910-37*

Year	Number of sealskins taken	Number of animals in herd	Year	Number of sealskins taken	Number of animals in herd
1910.....	12,964	132,279	1924.....	17,219	697,158
1911.....	12,138	123,600	1925.....	19,860	723,050
1912.....	3,191	215,738	1926.....	22,131	761,281
1913.....	2,406	268,305	1927.....	24,942	808,870
1914.....	2,735	294,687	1928.....	31,099	871,513
1915.....	3,947	363,872	1929.....	40,068	971,527
1916.....	6,468	417,281	1930.....	42,500	1,045,101
1917.....	8,170	468,692	1931.....	49,524	1,127,082
1918.....	34,890	496,432	1932.....	49,336	1,219,961
1919.....	27,821	524,235	1933.....	54,550	1,318,568
1920.....	26,648	552,718	1934.....	53,470	1,430,418
1921.....	23,681	581,443	1935.....	57,296	1,550,913
1922.....	31,156	604,962	1936.....	52,446	1,689,743
1923.....	15,920	653,008	1937.....	55,180	1,839,119

Before sale, the Government-owned sealskins from the Pribilof Islands are dressed, dyed, machined, and finished, so that when they pass into the hands of the public they are ready for making into garments. This work is done under contract by the Fouke Fur Co. at St. Louis, Mo. Public auction sales are held by the company twice a year for the account of the Government.

The manufacturing of meal and oil from fur-seal carcasses on St. Paul Island, where about four-fifths of the Alaska sealskins are obtained, was carried on in a small way for a number of years beginning in 1918, and on a larger scale in the seasons of 1935, 1936, and 1937. Except for small quantities retained at the islands for use as fox feed, these byproducts are shipped

to Seattle, where the oil is sold, and the meal is transferred to the Division of Fish Culture for use in feeding fish at Government hatcheries throughout the country.

The care of herds of blue foxes on St. Paul and St. George Islands during the winter months, when sealing activities are practically at a standstill, provides seasonal employment for the natives. Approximately 1,000 fox pelts are obtained each winter; they are sold at public auction, together with the dressed, dyed, and finished sealskins, by the Department's agents at St. Louis, Mo.

The revenue derived from the management of the Pribilof Islands fur-seal industry is shown in table 6.

Care of natives.—The 412 natives of the Pribilof Islands, descendants of those transferred there from the Aleutian Islands early in the period of Russian control, are virtual wards of the Government, who are provided with food, clothing, shelter, and other necessities of life, as well as receiving some cash compensation on a piece-work basis for the taking of fur-seal and fox skins.

Patrol.—Protection of the Alaska fur-seal herd is effected chiefly by vessels of the United States Coast Guard. This includes periods while the herd is migrating between the latitude of southern California and Bering Sea, and also while it is at the Pribilof Islands. Vessels of the Bureau of Fisheries also assist by patrolling the waters off Neah Bay, on the Washington coast, and in the vicinity of Sitka, Alaska.

TABLE 6.—*Receipts and expenditures, Fur-seal Service, Bureau of Fisheries, fiscal years 1918-37*

Fiscal year	Expenditures	Receipts ¹				Excess of receipts over expenditures	Excess of expenditures over receipts
		Sealskins	Fox skins, etc.	Miscellaneous	Total		
1918.....	\$198,678.75	\$69,946.48	\$34,356.88		\$104,303.36		\$94,375.39
1919.....	212,413.09	741,197.42	67,588.33	\$2,752.80	811,538.55	\$599,125.46	
1920.....	155,050.06	635,223.66	126,193.72	5,178.34	766,595.72	611,545.66	
1921.....	196,838.31	1,128,953.13	72,882.69	539.73	1,202,375.55	1,005,537.24	
1922.....	166,025.04	117,146.70	664.96	684.86	118,496.52		47,528.52
1923.....	179,038.65	238,068.79	164,472.97	238.15	402,779.91	223,741.26	
1924.....	176,705.21	110,956.09		2.00	110,958.09		65,747.12
1925.....	179,868.76	208,154.92	128,045.06	0,342.27	345,542.25	165,673.49	
1926.....	179,427.21	161,023.91	16,567.66	1,136.50	178,728.07		699.11
1927.....	181,787.89	259,751.45	21,008.08	1,520.28	282,279.81	100,491.92	
1928.....	194,333.81	278,885.78	21,607.32	318.46	303,711.56	109,377.72	
1929.....	201,622.18	287,833.01	62,697.41	48.50	350,578.92	148,956.74	
1930.....	349,268.41	240,777.92	32,029.80	1,183.28	273,991.00		75,277.41
1931.....	266,019.25	85,772.87	10,330.23	145.55	96,248.65		169,770.60
1932.....	212,124.65	125,725.84	11,965.64	290.05	137,981.53		74,143.12
1933.....	179,150.65			242.90	242.90		178,907.75
1934.....	146,984.11		16,230.13	3,010.09	19,240.22		127,743.89
1935.....	152,487.38	52,159.45	51,872.80	261.75	104,294.00		48,193.38
1936.....	171,372.41	175,050.13	17,437.52	5,368.83	198,756.48	27,384.04	
1937.....	178,305.18	251,112.33	19,002.27	8,033.61	278,148.21	99,813.03	
Total.....	3,877,501.06	5,168,639.88	877,853.47	40,297.95	6,086,791.30	3,091,676.56	882,386.32
Net excess of receipts over expenditures, 1918-37.....						3,091,676.56	2,209,290.21
							3,091,676.56

¹ Receipts are net amounts turned in to Treasury of the United States after payments of moneys due Great Britain (or Dominion of Canada) and Japan account fur-seal convention.

It will be noted from the foregoing that in the 20 fiscal years from 1918 to 1937, inclusive, a net profit of \$2,209,290.24 has been made as a result of activities at the Pribilof Islands, Alaska. It must be remembered that this profit has been made in the face of the fact that for several years there were heavy expenditures for construction of roads, the replacement of all native dwellings with modern buildings, for the most part of concrete, and the carrying out of an otherwise large reconstruction program, including the erection of warehouses, shops, barns, and other structures, as well as the erection of new salt houses and wash houses to handle the larger take of sealskins. The expenditures for the fiscal year 1930 include the cost of construction of a new tender for the Pribilof Islands at upward of \$140,000, and the 1931 expenditures include \$65,000 for the construction of a modern byproducts plant for the utilization of fur-seal carcasses at the Pribilof Islands.

Sealing privileges accorded aborigines.—Under the provisions of the North Pacific Sealing Convention of July 7, 1911, Indians and other aborigines dwelling along the coasts of treaty waters may take fur-seal skins by primitive methods, using open, unpowered boats, and aboriginal weapons; the use of firearms is prohibited. Table 7 shows the number of sealskins taken under the provisions of the treaty by Indians under the jurisdiction of the United States and of Canada.

TABLE 7.—*Fur seals taken by North American Indians under treaty provisions, 1912-36*

Year	Wash- ington	Alaska	British Columbia	Total
1912			205	205
1913	91		404	495
1914	14		352	366
1915			439	439
1916	470		159	629
1917	517	2	218	737
1918	395		88	483
1919	551		70	624
1920	1,287		1,058	2,345
1921	567	199	2,349	3,115
1922	1,107	526	930	2,563
1923	875	626	4,424	5,925
1924	1,029	8	2,248	3,285
1925	1,765	279	4,465	6,509
1926	1,035	40	2,824	3,899
1927	282	543	1,476	2,301
1928	708	773	2,421	3,902
1929	692	995	3,383	5,070
1930	450	85	2,297	2,832
1931	165	21	1,463	1,649
1932	73	78	1,787	1,938
1933	35	63	1,984	2,082
1934	23	11	256	290
1935	80	59	841	980
1936	28	11	1,888	1,927

Sea Otters

Legislative authority.—The act of April 21, 1910, specifically prohibits the killing of sea otters and certain other fur-bearing animals within the limits of the Territory of Alaska, except when authorized by regulations promulgated by the Secretary of Commerce. Under the regulations in effect since June 2, 1910, there has been no relaxation of the prohibition of the killing of sea otters within territorial limits of Alaska. The North Pacific Sealing Convention of 1911 further extended protection to sea otters by prohibiting all killing by nationals of the United States, Great Britain, Japan, and Russia on the high seas of the Pacific Ocean north of the thirtieth parallel of north latitude, including the seas of Bering, Kamchatka, Okhotsk, and Japan. The act of August 21, 1912, gives effect to this convention. Thus the killing of any sea otter on the American side of the North Pacific, both in territorial and extraterritorial waters, is prohibited.

Rookeries.—At the present time, the principal sea-otter rookeries are located in the western Aleutian Islands. Recent surveys of these waters by the Bureau of Fisheries in cooperation with other Government agencies having vessels in that region, including the

Navy Department, Coast and Geodetic Survey, Coast Guard, and Bureau of Biological Survey, have indicated that sea otters have begun to reestablish themselves at the more favorable rookeries. Studies are being made jointly by the Bureau of Biological Survey and the Bureau of Fisheries regarding the natural history and requirements of this valuable animal. A permanent station for this purpose has been established on one of the Aleutian Islands where fair-sized sea-otter colonies exist.

Patrol.—Patrol for the protection of sea otters is chiefly by the Coast Guard, which has general authority to enforce Federal laws on the high seas and navigable waters of the United States. The presence of other Government vessels in the vicinity of sea-otter rookeries acts as an effective deterrent to poachers. The slow rehabilitation of sea-otter herds in Alaska in spite of complete protection by law and regulation is evidence of poaching, and there is a real need for more adequate patrol.

Walruses and Sea Lions

Legislative authority.—Authority for the protection of walruses is contained in the acts of May 11, 1908, and May 31, 1920. These acts authorize the Secretary of Commerce to make and publish rules and regulations placing restrictions and limitations on the killing of walruses, or prohibiting killing entirely. Regulations promulgated under this authority prohibit the killing of all walruses in the Territory, except by natives for food or clothing, by miners and explorers in need of food, or for scientific specimens to be taken under permit issued by the Secretary of Commerce.

Sea lions are protected by the act of June 16, 1934, and regulations of the Secretary of Commerce made thereunder. These regulations, like those for the protection of walruses, prohibit all killing except by natives for food or clothing, and by miners or explorers in need of food. Sea lions also may be killed by anyone in the necessary protection of property or while such animals are destroying salmon or other food fish, and as scientific specimens under permits issued by the Secretary of Commerce.

Patrol.—The extensive operation of Coast Guard vessels constitutes an effective patrol of the walrus herds of northern Bering Sea and the Arctic Ocean. Sea-lion rookeries for the most part are reasonably accessible and come within the scope of patrol by Bureau of Fisheries vessels.

Interdepartmental Relations

There is some overlapping in jurisdictional authority of Federal agencies concerned with the aquatic resources of Alaska. The activities of the several De-

partments and Bureaus are well coordinated, however, and there is no duplication of effort. The Coast Guard, with its sweeping authority to enforce Federal laws on the high seas and on navigable waters of the United States, carries on fur-seal and sea-otter patrol and patrol of the halibut banks in exposed and remote regions that could not be patrolled by the Bureau of Fisheries or other agency with existing equipment and funds. Similarly, the Forest Service in the extensive National Forest areas of Alaska, engages in stocking barren lakes and streams with trout and other game fish to improve recreational facilities. In these activities there is close cooperation with the Bureau of Fisheries, thus insuring that trout will not be planted where they would be in any manner a menace to the salmon runs. The Bureau of Fisheries and the Bureau of Biological Survey are working in close cooperation to secure additional knowledge of the natural history of

sea otters. The State Department also is cooperating with the Bureau of Fisheries in a study of fishery rights beyond the 3-mile limit of the Alaskan coast.

Jurisdictional Problems

Territorial control of fisheries.—The organic act of August 24, 1912, creating a legislative assembly in the Territory of Alaska and conferring legislative power thereon, did not give the Territorial legislature authority to alter, amend, modify, or repeal the game, fish, or fur-seal laws in force in Alaska. At every recent session of Congress, legislation has been proposed which would transfer the jurisdiction, supervision, administration, and control over the salmon and other fisheries of Alaska to the Territorial Government. Such transfer has been opposed consistently by the Department of Commerce, because of the vast size of the Territory and its very small population. There has



FIGURE 16.—Brailing Salmon From Floating Trap

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been no marked increase in the population for many years. Until such time as the number of inhabitants shows real increase, it is believed unwise to put control of the Territory's far-flung fishery resources into the hands of such a comparatively small group of people, instead of continuing control by the Nation as a whole, as now administered through the Secretary of Commerce. When the population of Alaska builds up and attains more to the stature of statehood, then, and then only, should control of the fisheries be lodged in the local government.

Administrative Problems

Conflict between salmon-fishing interests.—Throughout the administration of the Alaska fisheries, there has been a continuous conflict between the operators of mobile forms of fishing gear and those who use stationary apparatus. For a number of years an effort has been made to secure passage of legislation which would prohibit the construction and operation of all traps, weirs, or pound nets, except herring pounds, limit the size of purse seine boats in the salmon fishery, and restrict the length and depth of purse seines used in Alaskan waters. This proposed legislation also would limit, and eventually entirely prohibit, seine

fishing for salmon except by residents of the Territory. Unfavorable reports have been submitted by the Department of Commerce on such proposed legislation, because it is not required to conserve the fisheries.

In some parts of Alaska traps are a proper and economical method of capturing salmon. In other places, where natural conditions are unfavorable, they are not considered proper and therefore are not allowed under the regulations of the Department of Commerce.

An important point for consideration in connection with the proposal to prohibit fish traps in the waters of Alaska, is that in parts of the Territory where traps are permitted the quality of the product is of the very best. Salmon caught in seines can be the equal in quality of those caught in traps, but the chances are greater that the consuming public may get a less satisfactory product if the salmon are caught by purse seines because the fish are usually deposited in the hold of the seine boat and not taken promptly to the cannery, whereas fish are not removed from traps until they are required for canning purposes. Trap-caught salmon, therefore, are always in a fresh condition when packed.

Another matter in considering the merits of traps and other types of fishing apparatus, is the fact that



FIGURE 17.—Salmon purse seine, Southeastern Alaska

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it is easier to enforce the law and regulations concerning closed seasons and places of operation in the case of traps than it is in the case of seines and other portable apparatus. Traps are at definitely fixed points and cannot be moved on a few minutes' notice as can the seines and other mobile types of gear. Purse seiners roam from place to place in the many hidden bays and inlets searching for schools of fish. There is often a temptation for them to go into rivers or other closed waters to make catches of salmon. The actual driving of salmon downstream from the spawning grounds into such nets has occurred from time to time. Not only is this practice most reprehensible from the standpoint of destroying parent fish after they have reached, or practically reached, the spawning grounds, but the fish from such waters are by no means of as good quality for canning purposes as those taken before their quality has been affected by attainment of maturity and by the influence of fresh water.

The record pack of 8,437,603 cases of salmon in Alaska in 1936, and the previous record pack of 7,481,830 cases of salmon in 1934, are sufficient proof that the salmon fishery has been maintained at a high level of productivity under the present method of administering the fisheries of Alaska. In view of this fact, the proposed abolition of traps in Alaska seems unwarranted.

In administering any natural resource where fluctuations in abundance, either through natural or artificial causes, cannot be foreseen, it is essential that there be flexibility in regulations to meet varying conditions. This principle is particularly applicable when divergent geographical and physical conditions are involved. Thus it cannot be expected that a law specifying uniformity in the size and character of fishing apparatus throughout Alaska can be as completely effective in conserving the salmon runs as the present law, which allows the Secretary of Commerce to make changes necessary to meet local conditions as required.

Each salmon stream maintains a self-perpetuating population and presents its own particular problem of conservation. Stringent regulations regarding size and operation of fishing gear in one region may be entirely unnecessary in another part of the Territory and, conversely, less stringent regulations permitting the use of large boats and seines in one area might seriously endanger the runs if applied in another area.

Greater protection of the Alaska salmon fisheries is possible under the present method of regulating the size and character of boats and seines, in accordance with the needs of each particular area, rather than by the inflexible provisions of law.

All resident fishermen are now employed, and the canneries accept fish of good quality delivered by such

fishermen. It is apparent that under the proposed legislation salmon-canning operations in Alaska would be greatly curtailed until such time as a much larger resident fishing population might become established. Based upon observations of the salmon industry in the State of Washington, where traps were abolished several years ago, it seems doubtful whether the salmon runs in Alaska could be utilized fully without the aid of traps, regardless of the number of seine fishermen employed.

Utilization of herring.—Another controversy in the administration of the Alaska fisheries has centered about the utilization of herring. Legislation has been proposed which would greatly limit the proportion of herring taken in southeastern Alaska for manufacture into oil and meal or fertilizer.

This proposed legislation has been repeatedly opposed by the Commissioner of Fisheries on the ground that it is not required for the protection and conservation of the herring fishery of Alaska. Adequate protection is provided for this fishery by the act of June 6, 1924, as amended, giving the Secretary of Commerce authority to promulgate protective regulations. These regulations, based upon fundamental facts regarding life history, habits, and abundance of herring in the waters of Alaska, as developed by competent scientists of the Bureau of Fisheries, assure the perpetuation of the herring fishery of the Territory.

During 1936, the last year for which complete statistics are available, there were five concerns in southeast Alaska operating herring-reduction plants, four of which carried on saltery operations as well. These five plants gave employment to 347 of the 396 persons engaged in the southeastern Alaska herring industry, and produced 21,864,051 pounds of meal and oil, as compared with 7,054,155 pounds of all other herring products of this region. The meal and oil were valued at \$595,845, while the value of all other herring products was \$93,640.

It is apparent from these figures that herring oil and meal are no longer byproducts of the herring industry. This is due to the fact that only a small part of the catch can be utilized for salting or as bait. The industry at present packs all the large fish which are suitable for curing, amounting to about 10 percent of the total take. The markets are unable to absorb any large quantity of cured small herring, and other methods of processing, such as canning, have never proved successful.

Although a considerable portion of the herring oil is used in the manufacture of soap, paint, and other nonedible items, large quantities are used in the manufacture of edible fats. Highly perfected processes of hydrogenation have made it possible to manufac-

ture fish oils into edible fats of excellent quality, such as lard and butter substitutes.

Herring meal is used widely as feed for poultry, cattle, and hogs. This product of the herring industry, therefore, is indirectly a food for human consumption.

Curtailment of commercial herring operations, as provided for in this proposed legislation, would result in the discharge of many persons now gainfully employed by herring-reduction plants. Such action scarcely could be based upon conservation requirements, as existing law gives the Secretary of Commerce authority to limit or prohibit commercial fishing as necessary for conservation needs.

Operations by Foreign Fishing Vessels

Beginning in 1930, and in every year since then, a number of Japanese floating canneries have been operated on the high seas off the Bering Sea coast of Alaska, and particularly in Bristol Bay. From one to four floating plants, together with numerous auxiliary fishing vessels, have been engaged each year, and although operations have been confined almost exclusively to crab fishing and canning, one vessel also has operated as a reduction plant, manufacturing fish meal and oil.

These cannery vessels range in size from 3,000 to 8,000 tons, and the fishing vessels vary from small motorboats to Diesel-powered trawlers of 400 tons. All necessary supplies and equipment are carried on board the cannery ship or delivered by a supply vessel during the season to enable the cannery and its auxiliaries to remain on the fishing grounds continuously for a period of about 4 months.

The crab fishery being exploited by these vessels has never been a source of material for American industry. The cost of operating there would be prohibitive to an American concern, but, largely because of an abundance of cheap labor, Japanese interests have found it a profitable undertaking.

There has been no objection to Japanese crab fishing in the extraterritorial waters of Bristol Bay, but the announcement by the Japanese Government in 1936 that extensive studies would be undertaken concerning the routes of migration and the availability of salmon on the high seas of Bristol Bay alarmed the American salmon packers, who have more than \$20,000,000 invested in salmon-canning plants and equipment in that area. The products of the Bristol Bay salmon fishery have a manufactured value of about \$12,000,000 annually, and employment is furnished to more than 8,000 cannery workers and fishermen.

The investigation by the Japanese Government began in 1936 and will not be completed until the close of 1938. The United States has been assured by the Japanese Government that no vessel of that country would be licensed to fish commercially for salmon off the Alaskan

coast before completion of the investigation. If the Japanese find that salmon-canning operations can be successfully carried on in offshore waters of Bering Sea, established American interests would be jeopardized, not only by Japanese fishermen but also by fishery interests of other countries seeking new waters to exploit.

The Bristol Bay red salmon spawn in the rivers and lakes tributary to that region in the late summer and fall. The young hatch the following spring but remain in their fresh-water habitat for 1 or 2 years before they migrate to sea and disappear. At the time of their seaward migration they are only a few inches long, but growth in the ocean is rapid, and 2 or 3 years later these salmon return to their natal streams in a mature state weighing 5 to 8 pounds. After spawning once all Pacific salmon die.

It is during the spawning migration that salmon are taken for commercial use. The fishery therefore must be carefully regulated to assure an adequate escapement to the spawning grounds for breeding purposes. The regulations of the Department of Commerce effective in Bristol Bay limit the size and character of nets and boats that may be used, limit fishing to the period from June 25 to July 25, restrict the waters in which fishing may be carried on, and provide weekly closed periods as long as 84 hours during which all commercial fishing is prohibited. These regulations have effectively maintained the runs of salmon in Bristol Bay at a high level of abundance, and exceptionally large yields have been realized in recent years.

The restrictive measures at times have entailed severe hardships and large monetary losses to fishermen and cannerymen. Because of these sacrifices and the fact that salmon taken off the Alaskan coast are spawned and hatched in American waters, and when intercepted in the ocean are returning to our streams, there is a strong feeling that the United States has a definite property right in such salmon regardless of their wanderings on the high seas.

It is evident that offshore operations on a large scale would seriously injure the established Bristol Bay salmon fishery and, to a large extent, nullify the value of protective regulations which have been imposed on American fishermen to perpetuate and maintain that fishery at a high level of productivity. The ultimate result could only be commercial extinction of salmon in those waters, a result which probably would be manifest within 10 years.

The various departments of the Government concerned are giving this subject most careful attention, and every effort is being made to develop effective means for the protection of American interests. Every resource of the Government must be brought to bear in dealing with this important problem.

Recommendations

Fisheries

The future development of the fisheries of Alaska depends upon the establishment of a firm scientific basis of fact regarding the extent of these resources, and proper methods of management to assure continued productiveness and to permit full utilization without danger to the supply. It is generally believed that the salmon resources are now exploited to their full capacity. The herring supply, in some localities at least, is already exploited beyond safe limits.

A firm foundation of fact also should be established to assure full usage of all available spawning grounds, with the object of increasing natural reproduction and to foretell variations in yield as a guide to safe utilization.

The immediate means of accomplishing these ends include the extension of scientific investigations of the supply of salmon and herring in the three major regions of Alaska, namely, southeastern, central, and western Alaska, and the exploration of offshore fishing grounds with suitable research vessels. During the coming year it is proposed to establish a small research field station on Baranof Island in southeastern Alaska, including the construction of a permanent counting weir and a laboratory boat for inshore waters.

A field laboratory should be provided at the head of Karluk River on Kodiak Island to study the variations in natural reproduction of salmon in this important river and to determine their causes. A fishery laboratory also should be established in Alaska, under authorization of Public No. 240, Seventy-first Congress, to serve as headquarters for fishery investigations, including both the biological study of the supply and the technology of capture, preparation, and marketing of fishery products.

Funds should be provided, also, (1) to set up a continuing project of spawning stream surveys and improvement measures in order to determine the physical condition on each of the numerous salmon streams, including the extent and condition of the spawning beds, obstacles to the passage of salmon in the stream, such as landslides, log jams, and man-made devices; and to carry out measures that will improve the condition of the beds and remove the above-mentioned obstacles; (2) to determine by scientific investigation the approximate number of fish that are required satisfactorily to seed a given unit of spawning bed area; (3) to establish weirs and place weir attendants on all the more important salmon streams to assure, as far as possible, that the optimum number of fish needed for spawning purposes are made available.

For many years all fishing operations have been conducted under strict regulation by the Department of

Commerce in territorial waters. The last 2 or 3 years, however, have seen the development of high-seas fishing in the Bristol Bay area and north of the Aleutian Islands in Bering Sea. The fishing vessels in this area capture salmon on their feeding grounds at sea and on their routes of migration toward the rivers for spawning. If this high-seas fishing is conducted in the future, it will nullify efforts of the Bureau of Fisheries to administer commercial fishing in accordance with the requirements of conservation. Exploration of the high-seas fishing grounds has been conducted by the Japanese Government, and some hydrographic data have been secured in the central part of the Bering Sea by one cruise of a Coast Guard vessel. Other than this, no information is available from any source regarding the salmon or conditions surrounding their existence after they leave the rivers as seaward migrants 1 or 2 years old, until they return to the shore areas to spawn. The following problems therefore are presented to conservation authorities:

(1) Where are the feeding grounds of Bristol Bay salmon during their 1 to 4 years' sojourn in the sea?

(2) Where do the schools of salmon congregate to start their inshore migration? At what time of year does this occur?

(3) What routes of migration are followed from the offshore feeding grounds? How much time is required for this migration from the various areas to the several rivers?

(4) What is the relative contribution from the various portions of the feeding grounds to the several spawning rivers?

(5) What is the effect on the total supply of the present scale of commercial fishing on the high seas? How will the total supply be affected by increased fishing intensity in this region?

(6) What are the factors affecting migration of the salmon, such as age, varying food supply, growth, and homing instinct? How can the inshore fishery be managed in view of all these circumstances to permit maximum utilization and assure the perpetuation of the resource?

(7) What legislative or administrative action is necessary to accomplish wise conservation of the supply?

In order to acquire all the necessary facts to answer the above questions, two types of investigation must be undertaken: (1) A study of the offshore life of the salmon, the effects of the fishery, and oceanic conditions affecting the growth and migration of the salmon; and (2) a study of the inshore fishery and the needs and effects of various types of regulation.

The offshore investigation should involve a systematic program of experimental fishing with various types of commercial gear to discover the location of the feeding grounds of salmon in the offshore waters, their schooling habits, and their migratory routes. Two vessels of the commercial purse seine type would be required for this work to make observations in an area not less than 100 miles wide and several hundred miles long. The salmon caught in the experimental gear

at sea and in the vicinity of Unimak Island should be tagged to trace the actual movements of the schools. At the same time, hydrographic observations should be made as a basis for understanding and explaining variations in migratory movements or concentrations from year to year. Biological data on growth, age composition, and feeding habits should be obtained at the same time to explain schooling and concentration in different areas as discovered.

The inshore investigation should be closely correlated with the offshore studies. Observers should be stationed at each of the important points of landing in the various rivers around Bristol Bay to recover fish tagged in offshore areas, to record the age-characteristics of the runs to each of the rivers, and to observe the effects of inshore fishing on the supply. Studies of age composition of the stock and of the commercial catch are important in order to determine the contribution to the stock from each spawning population each year. Since Bristol Bay salmon return to spawn at ages varying from 4 to 7 years, the commercial catch fluctuates from year to year in accordance with the relative contribution of each age class to the spawning runs. A knowledge of the factors affecting the age at maturity, therefore, is essential to forecast the size of the annual runs and in considering the effect of the commercial fishery in either offshore or inshore waters upon the maintenance of the supply.

It should be emphasized that such an investigation must be continued through at least one complete life cycle of salmon, or at least 5 years. Thereafter observations of a less intensive nature probably will be sufficient to guide conservation efforts in accordance with changing natural and economic conditions.

Additional patrol vessels for enforcement of the Alaska fishery laws and regulations should be provided. At the present time 14 Bureau of Fisheries vessels and a number of speedboats are engaged in this work. The average age of the larger vessels is 17 years, and many are no longer suitable for patrol in exposed waters. The fleet of fishery patrol vessels and speedboats should be increased as soon as additional funds can be made available.

While the game fish in the inland waters of Alaska at the present time do not appear to be diminishing, care should be taken now to avoid the mistake so widely made in the States of providing protection too late. Reasonable restrictive regulations of the Department of Commerce are now in effect in the Territory, but personnel and facilities for enforcement by the Bureau of Fisheries are inadequate. Employees of the Bureau of Biological Survey (Alaska Game Commission) and Forest Service, as well as the Bu-

reau of Fisheries, should be designated to enforce the regulations relating to game fish in the Territory.

There should be a thorough survey of game trout possibilities predicated on a scientific study of all the streams and lakes and reservoirs, with due regard to the salmon industry. There also should be provided facilities to produce game fish for stocking barren streams and lakes, where studies indicate that such planting would be successful.

Fur Seals

One of the chief needs in connection with the fur-seal industry at the present time is a further study in regard to the rate of increase of the herd under prevailing conditions, and the possible advisability of killing surplus animals from other than the 3-year-old male class as a means of obtaining the maximum number of skins consistent with the maintenance and continued growth of the herd. For several years there has not been as large an increase in the number of killable seals as expected, in view of the mortality rates now in use for computing the size of the herd. These rates are based upon information obtained through branding operations in 1923 and 1924, and upon certain subsequent observations. In the interests of effective management of the sealing industry, it seems desirable to make a periodic study concerning the mortality of seals at sea in order to ascertain any material change in the rate of growth of the herd as its size increases.

In view of the expansion of the fur-seal industry in recent years, some of the facilities for handling the work have become inadequate. Not only must the buildings and equipment for the washing, blubbering, and curing of sealskins be kept in repair and the plants enlarged to handle increased takes of skins, but adequate provision must be made of native dwellings and community houses, as well as residences for Bureau personnel and quarters for temporary employees. The temporary employees include approximately 25 men of the Fouke Fur Co. who blubber the sealskins at St. Paul Island, about 15 assistants such as foremen, machinists, and byproducts-plant operators, and about 85 natives from the Aleutian Islands who are employed for a few months each year to assist with sealing activities.

An addition to the bunkhouse and at least four new houses for natives on St. Paul Island and a community house on St. George Island are urgently needed. The erection of a small bakery on St. Paul Island, equipped with dough mixers and proper baking ovens, is desirable, in order more adequately to take care of the mess for approximately 125 persons during the sealing season. A hospital is needed on St. George

Island, and a machine shop on St. Paul Island. Surfaced roads on both islands should be extended to facilitate transportation of the sealskins from the killing grounds to the curing stations, and additional rookery walks should be built to permit a more accurate estimate of the size of the harems and the number of animals in the herd. An extension should be made of the dock at St. George Island, and an electric hoist should be purchased for unloading supplies.

Sea Otters

Legislative and regulatory protection for sea otters is satisfactory, but patrol facilities are inadequate. There has been some evidence of illegal sea-otter hunting in recent years, and a number of prosecutions and seizures have been made. The extremely slow rehabilitation of sea-otter colonies suggests the probability of extensive illegal hunting of these animals. The lack of protection which has resulted in such illegal operations is due largely to the lack of funds and facilities with which to properly patrol the areas involved. The remoteness of the sea-otter colonies, principally in the western Aleutian Islands, also has contributed to the difficulties of sea-otter patrol.

Employees and vessels of all Government agencies in western Alaska should be designated to enforce the Federal laws and regulations for the protection of sea otters. The Bureau of Fisheries, Bureau of Biological Survey, and the Coast Guard would be the agencies primarily concerned with such joint control. The Coast Guard also should station one or more vessels

in the western Aleutian Islands throughout the year to carry on sea-otter patrol. One or more shore stations should be built and maintained in the western Aleutian Islands region in order that a more effective patrol may be provided for the protection of the sea otters.

In connection with its patrol and law-enforcement work, the Coast Guard plans, during 1938, to base a plane at Unalaska. It is believed that in the detection of illegal activities in the Aleutian Islands a plane will be of the utmost value. Flying conditions in Bering Sea being hazardous on account of frequent low visibility and violent wind squalls and an almost total absence of aids to flying, the Coast Guard plans on operating the plane from a suitable surface vessel. For the efficient maintenance of a plane, however, a hangar at Unalaska will be required.

Alaska Natives

The laws and regulations governing fisheries in Alaska permit the natives of the Territory to take at all times such fish as may be required for food, including fish taken during the summer season to be dried or otherwise cured for use during the winter. Existing laws and regulations for the protection of seals, walruses, sea lions, and whales also give preferential treatment to the native inhabitants of Alaska insofar as securing these animals for local food requirements is concerned. The rights of the natives in this respect should be protected.

MINERAL RESOURCES¹

To the end of 1936 minerals to the value of over \$722,000,000 have been produced from Alaska mines. About 65 percent of this total was afforded by the gold mines and 30 percent by the copper mines. Silver, platinum, lead, tin, coal, oil, marble, and a number of other mineral commodities to the value of more than \$23,000,000 have contributed to this total. That the mineral resources of the territory have added largely to the national wealth is therefore a demonstrated fact. That these resources are of great present significance is shown by the record of the annual production which,

¹Prepared by a group composed of Dr. Philip S. Smith, Geological Survey; John A. Davis, Bureau of Mines; Dr. W. H. Young, Bituminous Coal Commission; Thomas Haveli and C. G. Tudor, General Land Office; Colonel H. K. Rutherford, U. S. Army; Capt. James S. Woods, U. S. Navy. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above named group.

for the 5 years from 1932 to 1936, inclusive, averaged more than \$16,000,000 a year and in 1936 was well over \$23,000,000.

What amount of minerals can ultimately be supplied by the Territory is still highly problematical. Quantitative data are too inadequate to form the basis for any close estimates as to the placer gold reserves, but Smith has published the following statements regarding them:

That the reserves are large cannot be doubted; that, judging from the facts in hand, they may be \$500,000,000, or twice as great as the amount of placer gold already recovered seems reasonable; that new large-scale developments may demonstrate reserves of even more than double the past production is regarded as not at all improbable.²

²Economic Geology, vol. 25, pp. 176-196, The Gold Resources of Alaska.

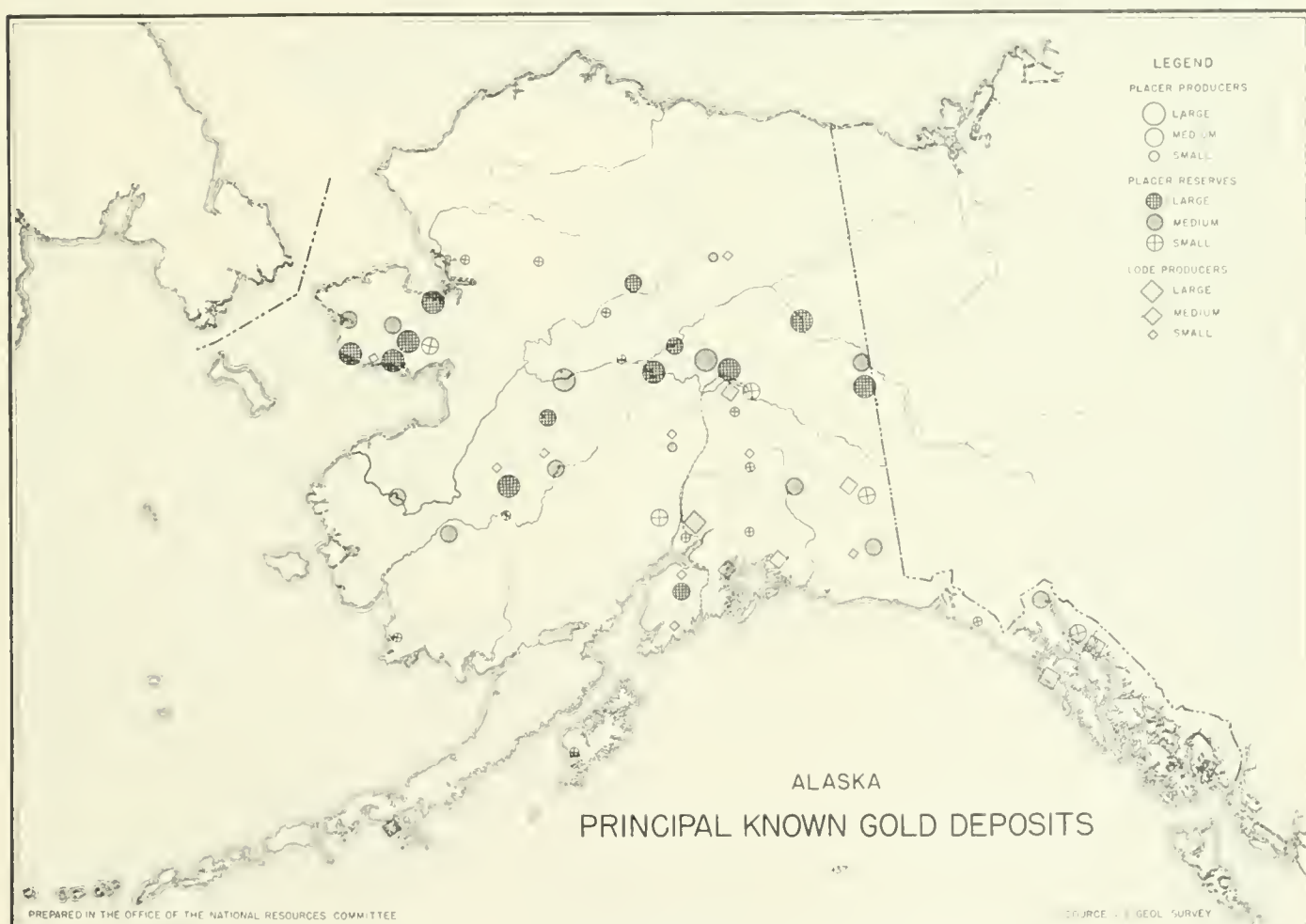


FIGURE 18



FIGURE 19.—Alaska-Juneau Gold Mine Mill

COURTESY WORKS PROGRESS ADMINISTRATION

The areal distribution of the principal placer-gold producing areas is diagrammatically shown on the accompanying illustration, figure 18. On this figure the three sizes of circles used indicate large, medium, and small past production. No precise quantitative value has been assigned to these various terms, but, in general, "large" indicates that past production of placer gold has been more than \$5,000,000; "small" indicates it has been less than \$500,000; and "medium" that it has been between the two. The terms used in describing the probable reserves can even less accurately be reduced to numerical equivalents, but, in general, may be considered to indicate several times larger amounts than the same terms when used in connection with past production.

Estimates of the reserves of lode gold are more indefinite than those for placer gold, but it is the consensus of opinion of those geologists most familiar with the Alaska mineral deposits that the reserves of gold in the lodes may far exceed those in the placers. The location of the principal lode-gold producing districts is also shown diagrammatically on figure 18.

The facts in hand are still too meager to justify even wild guesses as to the value of the other mineral resources of the Territory. It has, however, been amply demonstrated that many of these other mineral products have already been found in commercial quantities at widely separated points in the country and have contributed notable amounts to its output of mineral products. Space does not permit discussion in detail of each of the various minerals but figures 20 to 24, inclusive, on which the distribution of some of the better-known deposits are indicated, will give some insight as to the variety of different minerals that have been found and the widespread occurrence of some of them. These diagrams should not be interpreted by any as indicating all the occurrences. In the first place, the available information has been very much generalized, and in the second place, less than half of Alaska has been surveyed for mineral products, even in an exploratory fashion, by technical agencies. More adequate presentation of the known facts as to the occurrence of the mineral products of Alaska is contained in the hundreds of reports and articles

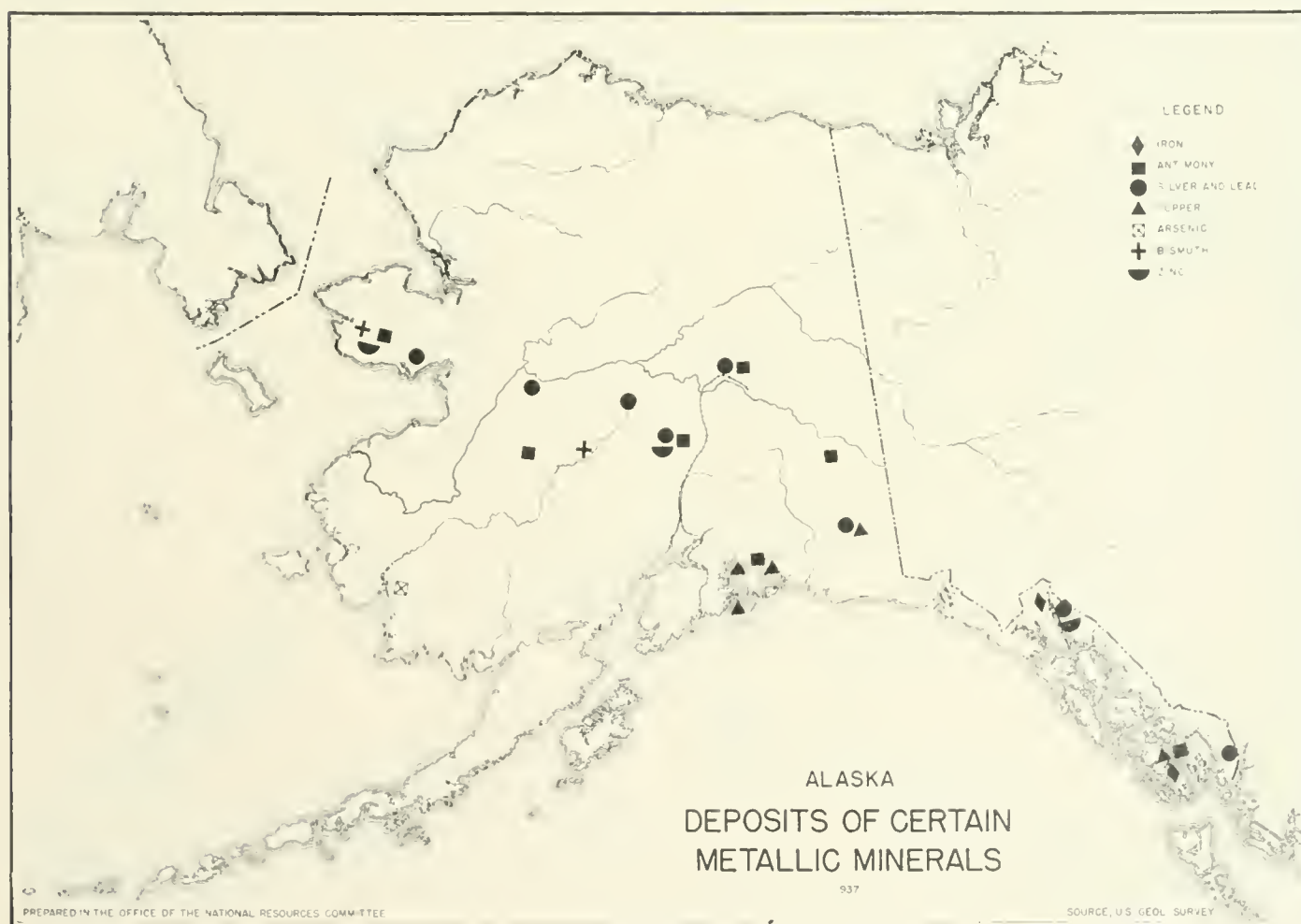


FIGURE 20

that have been issued by the Geological Survey and by the Bureau of Mines. Furthermore, it has not proved expedient to indicate on these diagrams the occurrence of many of the mineral commodities, such as building stone, gravel and road ballast, limestone, and clays which have low unit value in proportion to their weight. There are extensive known deposits of many of these materials, some of which have already been developed commercially. Were it not for cost of production and marketing, these and many of the now known but undeveloped deposits might supply almost limitless quantities. In their present situation few of them offer any attraction for development except to supply local needs, which are for practically negligible amounts of raw material. This present condition necessarily will change as development of the whole Territory progresses, so that ultimately those almost inexhaustible materials may become even more valuable than all of the other mineral products.

From the foregoing brief summary it is readily apparent that Alaska holds vast potential reserves of minerals, as yet undeveloped, that will contribute to

the national welfare. The actual exploration and development of these deposits must necessarily depend in large measure on private enterprise, but those efforts should be aided by proper governmental activities and encouragement. Among the lines along which the Government can appropriately be most helpful are suitable laws for the acquisition and development of mineral lands, adequate general surveys, both topographic and geologic, fundamental studies in the processes of extraction and beneficiation of the ores, and the extension of roads and other facilities by which the mines may be made accessible and the products carried to market economically.

Provision for all of these proper governmental activities already exists and they are carried out by various designated Federal agencies so far as the existing conditions permit. Most of these organizations, however, fall far short of what they might accomplish if more adequately financed. As an example, less than half of Alaska has been surveyed topographically or geologically, even on reconnaissance standards, so that for an area of about 300,000 square miles there is no

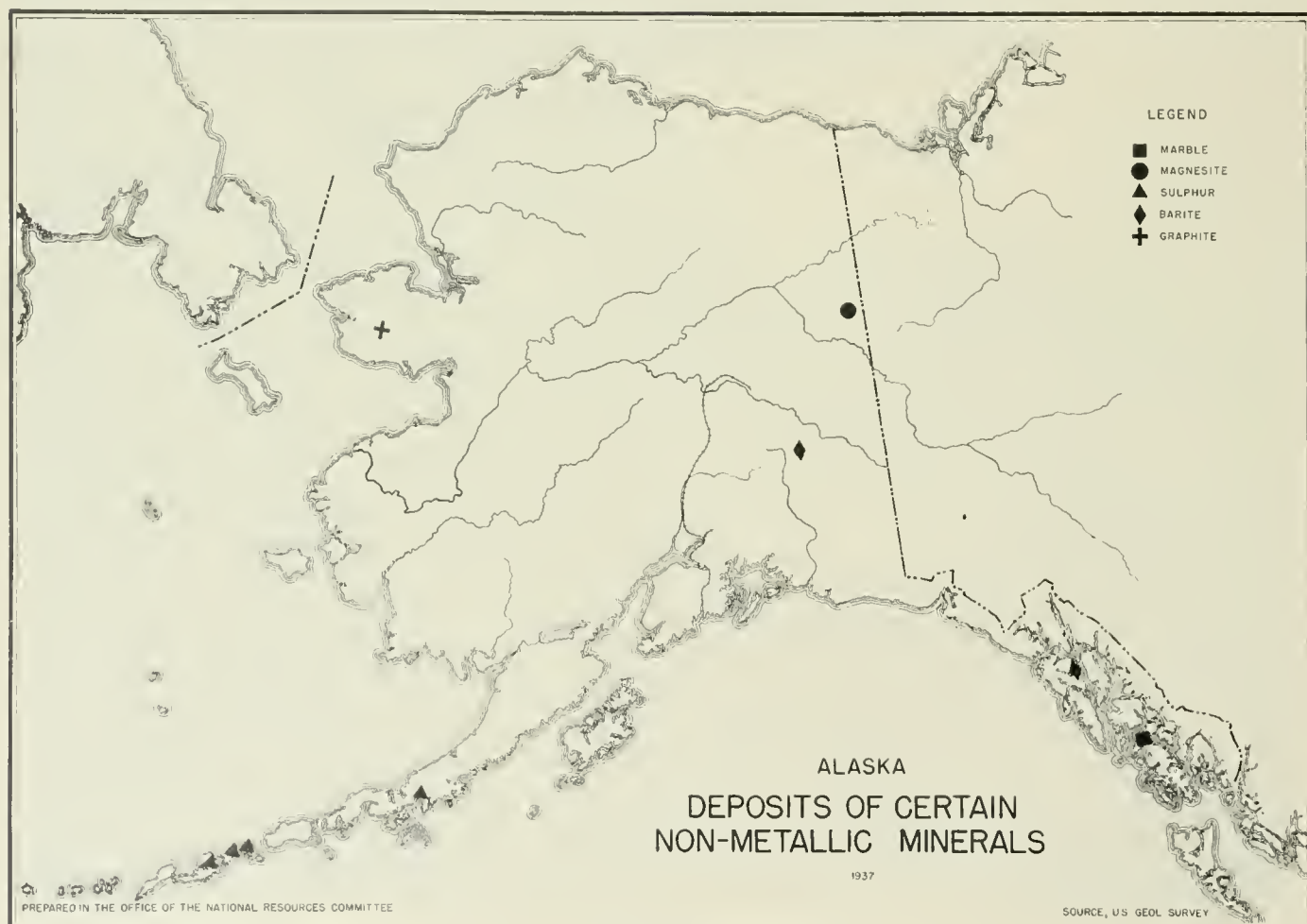


FIGURE 21

dependable information available as to what geologic conditions prevail or really as to what mineral deposits may occur in them, although perhaps two-thirds of this unsurveyed area is regarded as likely to contain in places mineral deposits that may be of value. At the present rate at which the unmapped areas are being surveyed it will be many scores of years before even this preliminary work will be accomplished. Obviously, in the meantime, in the absence of reliable information, planning and development of the possibly productive areas must proceed along more or less hit-or-miss lines, resulting in wasted effort, unwise expenditures, or retarded development and extravagant duplication.

It is difficult to overestimate the importance of the mineral industry to the general welfare and development of the Territory. According to the Fifteenth Census about 4,800 persons were gainfully employed in the Alaska mines and they and their families were thus directly supported by their earnings or wages from them. Probably as many more persons are con-

cerned with mines and prospects that they hold interests in and doubtless an even greater number of people make their living by furnishing supplies or equipment used in the mines or by the prospectors. Statistics are not available for analyzing the income derived from the mines of Alaska by these different classes, but it is readily apparent that if the total value of the 1936 output of minerals were distributed equally to each individual member of the white race in Alaska as recorded in the latest available census (about 30,000 persons), the share of each in that year's production of minerals would have been approximately \$800.

The whole theory of mineral development in the United States in the past has been to encourage the private citizen or organization to discover and utilize the valuable deposits that may be contained in the national domain, and to facilitate having these deposits pass into private ownership. Criticisms of this policy have arisen from time to time and the adoption of the leasing system for oil and gas lands has in part met some of these objections. Possibly other modifications

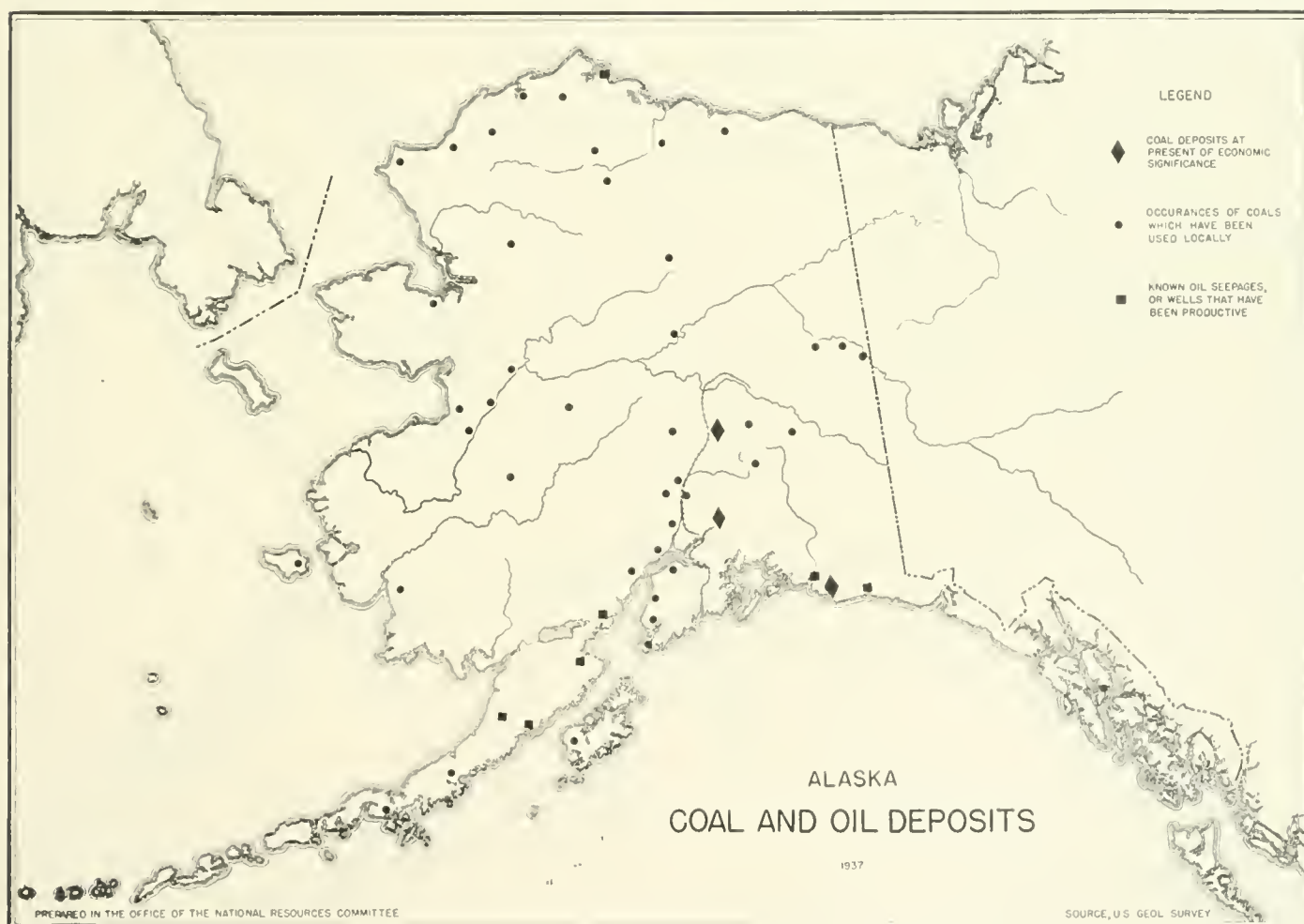


FIGURE 22

should be worked out, but the authors of this report are of the opinion that until some other policy has been formally announced by Congress it would be unwise to consider placing restrictions, further than are contained in existing mining laws, on prospecting or the acquisition of mineral deposits and the conduct of mining in Alaska. In fact it would seem that more rather than less encouragement should be given to Alaska miners and prospectors than to those in the States.

Before attempting to outline the future work that should properly be done by the Government to aid the mineral industry it perhaps would be well to sketch briefly what has been done in the past or is now in progress along those lines. In this summary various types of investigation and work that are not directly related to mining but which are essential to the mining industry will not be treated here, as they are more fully discussed elsewhere in the staff reports on other subjects. Among the activities that have been instrumental in aiding mining but are not further discussed

here are the building of roads and trails by the Alaska Road Commission and the Bureau of Public Roads, the system of transportation afforded by the Alaska Railroad and its connecting boat service, the radio and telegraph services maintained by several Government agencies, the timber and other investigations by the Forest Service, the general surveying and charting that has been carried on by the Geological Survey, the Coast and Geodetic Survey, the Navy Department, the General Land Office, or the surveys of the water resources that have been made by the Geological Survey, the Forest Service, and the Federal Power Commission.

By far the larger part of the investigations that have been made of the mineral resources of Alaska are those carried on by the Geological Survey. This work, started in 1895, has been continued uninterruptedly from that time to the present. These studies have embraced all phases of investigation that are contributory to the finding of mineral deposits, description of their geographic and geologic characteristics, and current

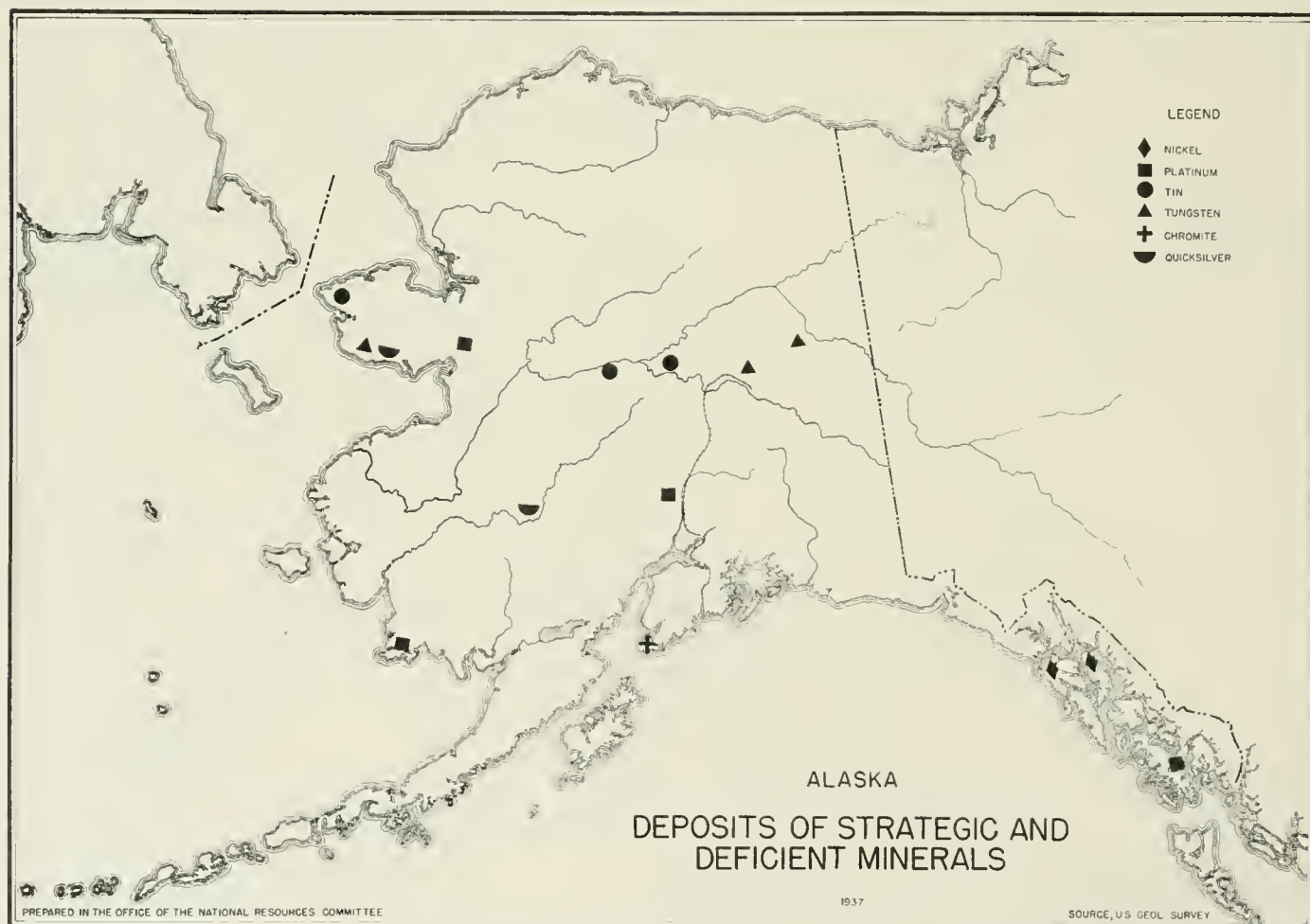


FIGURE 23

records of production and of mineral development. In the course of this work hundreds of reports have been issued which have covered in more or less detail all of the principal known mineral deposits in the Territory, as well as about 250,000 square miles of country that had not been surveyed geologically before that work was undertaken.³ Its maps and reports are generally regarded as the most dependable sources of information, and almost the only adverse comment heard is that not more of them are available. Its present program is directed toward covering as rapidly as funds permit the areas that are regarded as having mineral possibilities but that have not yet been surveyed, or in examining in more detail areas in which new discoveries or activities indicate that such work is urgently needed. This program is, however, now so inadequately financed that it provides for undertaking only three or four projects a year, which is not nearly enough to meet the calls for service that are received nor meet the best interests of the industry.

³ A selected list of Geological Survey publications, reports, and maps on Alaska may be obtained from the Washington, D. C., offices of the Survey.

Considerable assistance to the mining industry was furnished in the past by the Bureau of Mines, operating under the general authority of its organic act. A selected list of the Bureau of Mines publications relating to Alaska is given at the end of this section. In 1925, however, it withdrew largely from activities in the Territory and closed its mining experiment station in Fairbanks, and since then has had only a small force in the Territory, consisting now of an engineer, looking after problems of mine safety, and a coal sampler or chemist, whose work relates principally to the purchase of coal by the Alaska Railroad.

In 1931 a special grant to the Alaska Railroad of funds available until expended enabled the railroad to make some intensive examinations of mineral tracts that might be of significance in affording tonnage for the railroad. This work was carried on largely in cooperation with the Geological Survey, and a dozen or so of the more promising areas were examined in some detail, even to the extent of drilling several thousand feet to test certain coal-bearing deposits. In addition, a geologist was assigned to the staff of the railroad to

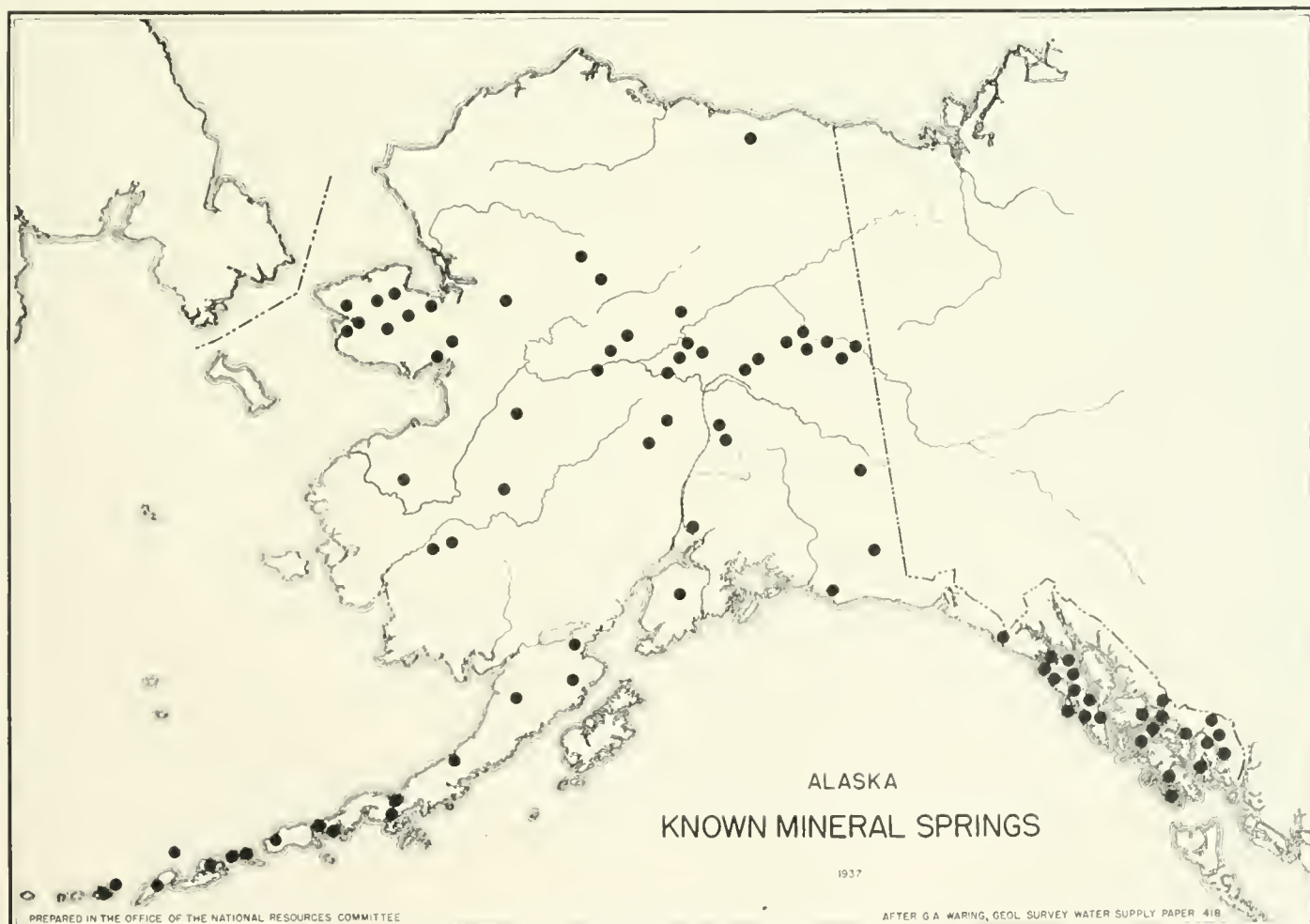


FIGURE 24

give such aid as his special knowledge of the occurrence of minerals might suggest. During the course of that service the Government coal property at Esko was surveyed in detail, a new opening was driven to afford coal for railroad use in an emergency, and the property put in shape for operation should need arise. This geologic and engineering service was discontinued in the summer of 1937.

For some years a Federal laboratory for testing and assaying samples of ores and minerals was maintained at Fairbanks, Alaska, first by the Bureau of Mines and later by the Geological Survey. Action in 1937 by the Territorial Legislature, in providing for maintenance of three such laboratories at Territorial expense, has enabled the Federal Government to discontinue its laboratory.

In the fulfillment of its duties under the land laws of the United States the General Land Office, in addition to making subdivisional surveys of the lands of the national domain, is required to determine a number of facts relating to the mineral character of lands applied for in Alaska. To do this work other units of the Government, such as the Geological Survey, are freely consulted or, if necessary, special agents prepare field reports of their findings. The files of the General Land Office therefore contain much information as to the mineral resources of the special areas applied for, but could not serve as the basis for any thorough appraisal of the mineral resources of the Territory as a whole. The laws for the acquisition of mineral lands have purposely been framed by Congress so as to encourage the small operator and prospector and thus lead to the discovery and development of the workable deposits. Different laws apply to different mineral substances and the interpretation and application of each to specific problems have given rise to a complex body of technical rules and regulations that cannot be briefly summarized. Persons interested in the acquisition of mineral lands from the Government should therefore consult the general pamphlet on the subject, issued by the General Land Office⁴ or take up their problems with the officials of that organization.

Some of the emergency organizations, such as the Reconstruction Finance Corporation, have agents investigating certain aspects of the mineral resources of tracts on which loans or other aid is desired. These studies, however, relate exclusively to lands now held in private ownership and therefore do not contribute much to a general inventory of the Territory's mineral resources.

Recommendations

All of these governmental agencies that have been established to aid the mining industry should be continued and assisted in the execution of their respective jobs. On the whole, each of their respective tasks will be simplified and rendered more effective if more adequate information as to the Territory's resources were available, so that information could be used in formulating wise plans for proper utilization of these latent resources. The information that is needed concerning Alaska's mineral deposits along the lines sketched above far exceeds the amount that could be gathered through any reasonable expenditure of money or that can be acquired quickly. Not only is the matter of funds a serious limitation, but perhaps an even more difficult obstacle would be the assembling of a competent personnel to carry on the work effectively. For these reasons it has been deemed wise to eliminate consideration here of all but the most urgent of the projects that need early attention. The following recommendations therefore should be regarded as minimum requirements to meet current needs and to carry on a moderate systematic program. As presented these recommendations do not include specific reference to certain activities, such as topographic mapping, air, road, and water transportation, and water investigations, which, while urgently needed and of vital concern to the development of the mining industry, are the subjects of separate staff reports.

1. Geologic surveys to cover on reconnaissance standard each year in the neighborhood of 5,000 to 10,000 square miles of hitherto unsurveyed or inadequately surveyed country. This would allow undertaking 10 to 15 projects, and provide for the necessary technical personnel, assistants, and field helpers and equipment and supplies for the same, as well as the office and laboratory work required to complete the report setting forth the results. This program is based on the assumption that the required topographic maps will have been prepared as part of the topographic mapping program and be available for the use of the geologists.

2. Detailed regional geologic, technologic, and mineral industry surveys in the more productive areas with a view to determining the extent and characteristics of the deposits and the content of the mineral reserves that may become significant. Three to five surveys of this sort should be undertaken each season, with properly qualified personnel and necessary field and office support. In this work special stress should be laid on acquiring more adequate quantitative results than are customarily secured by the Geological Survey in its regular investigations. For this work it is also

⁴ Information, Laws, and Regulations regarding the Public Lands in the Territory of Alaska. General Land Office Circular 491.

assumed that suitable topographic maps will be available.

3. Similar detailed surveys and search for deposits of special minerals which, if available, would be of particular national importance. Among these minerals are tin, nickel, platinum, tungsten, and chromium. The work should be carried on with the aim of establishing the facts as to the quantity of each mineral available, the possibilities for development and production of each, and such other geologic, geographic, mining, and metallurgical information as would be essential if the deposits are to be of national use.

4. Special studies of significant, broad, economic factors that are pertinent to the development of mineral deposits, such, for example as the distribution, character, extent, and origin of frozen ground in the mineral areas that are determined to have special economic significance; studies of variation in the fineness of gold as an indication of its geologic history and as an aid in prospecting for workable deposits; cooperation with water resources investigations regarding ground-water problems; application of geophysical methods of prospecting to special Alaska conditions; and determination of efficient and economical methods of mining, concentrating, and smelting suitable for the various mineral deposits.

5. Any direct move by the Government to subsidize individual prospectors to undertake the discovery of mineral deposits is not favored, as the existing land

laws are intended to provide adequate reward for such efforts. So far as we are informed regarding practices in foreign countries, we know of no other methods of investigation being used for the stimulation of mineral production that have not been utilized in Alaska work so far as existing conditions permit, if they appeared to be applicable to American usage.

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WILDLIFE RESOURCES¹

Introduction

Fur was the lure that brought the Russians to Alaska in the latter half of the eighteenth century and from that time onward the fur resources have played an important part in the economy of the Territory. The natives, who now constitute one-half of the total population, have depended on fur for a substantial part of their livelihood since the world's fur markets were first opened to them by these Russian traders and many of the whites also rely on it to provide the cash necessary to buy modern necessities and comforts. The game animals have likewise contributed heavily and over an indefinitely long period to the support of the local residents but for home use products rather than to supply articles of commerce. Because of the small total population, which averages only one person to 10 square miles, this long-continued drain has not made serious inroads on the originally abundant fur and game resources with the exception of the seal and the sea otter which were almost exterminated but are now being restored.

The abundance, variety, and distinctive characteristics of its principal wildlife species give Alaska a high place among the important wildlife regions of the world. No other feature of the Territory provides as much interest to the people of the United States, and it sends north a constantly increasing number of hunters, naturalists, photographers, painters, tourists, and other visitors. Both sound economics and sentiment dictate that a definite and very prominent place be given to the perpetuation of an abundant supply of wildlife in the drafting of any plans looking toward the future well-being of the Territory. The great decrease in the wildlife of the West as unplanned and unrestricted settlement progressed across the country, and the strenuous efforts now being made to restore some small fraction of it at the insistence of a growing multitude of outdoor recreationists clearly indicate that such planning for the Alaska wildlife is necessary and should be started now while the resource is still almost intact and before extensive conflicting interests spring up.

Alaska is a large country. It covers more area than that section of the United States north of North Carolina and Tennessee and east of the Mississippi River and embraces a great variety of physical conditions and resources. It thus affords ample opportunity for growth along many lines, but this expansion should be based on a careful study of the local situation, region by region, and the establishment of objectives and practices most applicable to each. Great portions of many of these regions will doubtless be found best adapted to permanent wildlife use. Other portions of the same regions may justify other and more intensive uses, and the several potential activities, including the "wildlife industry," may be so built up as to insure a well-rounded economy for the region as a whole. Widespread public interest in frontier conditions and wilderness game and fur animals leads to the belief that a wholly satisfactory economy can be based in large part on the maintenance of large areas in a quite primitive state and the entertainment of visitors to these areas.

Present Status of Wildlife Resources

At the present time fur animals of Alaska are being cropped as closely as appears consistent with the maintenance of a safe breeding stock. Reports on the export commerce of Alaska for the fiscal year ending June 30, 1936, place fur skins third of all commodities as to total value with shipments, including seal fur, amounting to \$2,264,467. This annual production of furs is divided among about 8,000 trappers, a substantial majority of whom are natives or of native extraction. The fur bearers of the Territory are widely distributed and reports indicate that the number of animals is not seriously diminishing.

Fur farming is an important and valuable adjunct to the production and conservation of wild fur animals. Blue fox ranching on the various islands in the Aleutian group and some of the smaller islands in Prince William Sound and southeastern Alaska has become a well-established interest. During the past year about 8,000 blue foxes were pelted from Alaska's island ranches. Silver foxes are also being raised successfully in some portions of the Territory, notably on the Kenai Peninsula. Mink ranching is now on a firm basis and considerable opportunity exists for expansion in the pen-raising of fine stock for which Alaska has become famous. Fish, the basic food, is plentiful. Although attempts have been made at vari-

¹ Prepared by a group composed of Ira N. Gabrielson, W. C. Henderson, and W. C. Crouch, Bureau of Biological Survey; V. H. Cahalane, National Park Service; H. L. Schantz, Forest Service; J. C. McCaskill, Office of Indian Affairs; Capt. William H. Munter, the Coast Guard. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

ous times, and are still in progress, to raise other fur bearers, such as marten, muskrat, white fox, land otter, and beaver, the returns have not shown much hope for commercial development. During the fiscal year ending June 30, 1937, 240 fur-farming licenses were issued by the Alaska Game Commission. Alaska is well adapted to raising fur animals and the pelts produced there are known to be of good quality.

The outstanding big game animals of the Territory include the group of huge bears known as the Alaska brown bear, various species of the grizzly bear group, polar bears of the Arctic seas, moose, and white mountain sheep. Other valuable wild animals are caribou, black bear, glacier bear, mountain goat, Sitka black-tailed deer, and rabbits.

Waterfowl breeding grounds are found on the shores of the Arctic Ocean and the Bering Sea. Of the upland game birds the ptarmigan and grouse are the most important.

The Alaska brown bears are the largest carnivorous animals in the world and are found on the islands and in the coastal sections of southern Alaska from southeastern Alaska to the Aleutian archipelago. They have a range in the Territory of not less than 100,000

Furs shipped from Alaska during the years 1927-36

[Compiled by the Alaska Game Commission]

Species	1936		1927-36	
	Number	Total value	Total number	Total value
Bear:				
Black or glacier	178	\$178.00	4,153	\$14,512.28
Polar	58	1,421.00	594	24,513.50
Beaver	25,046	310,570.40	199,511	3,068,537.24
Coyote	1,098	7,356.00	4,153	42,168.55
Fox:				
Red	19,937	234,259.75	172,548	4,364,897.32
Cross	2,889	62,835.75	21,401	1,012,554.13
Silver	(0)	(0)	(0)	(0)
Black	1,573	70,785.00	10,511	779,013.18
White ¹	5,102	99,489.00	57,732	2,032,795.88
Blue ²	9,026	279,806.00	89,805	3,983,125.13
Hare	177	17.50	3,825	1,750.50
Lynx	2,421	87,761.25	36,735	1,410,482.18
Marmot	69	10.35	1,541	828.70
Marten	1,306	26,120.00	18,948	376,809.76
Muskrat	44,016	462,168.00	419,124	4,235,519.94
Otter	153,772	192,215.00	2,481,404	1,930,135.59
Squirrel	3,235	45,290.00	30,691	554,848.93
Weasel (ermine)	263	26.30	7,431	937.30
Wolf	11,012	7,708.00	136,800	140,563.68
Wolverine	904	17,628.00	5,258	126,473.10
Wolverine	290	2,146.00	4,758	63,357.96
Total	282,372	1,907,792.10	3,703,923	24,166,124.85
Pribilof Islands, foxes only:				
White	15	238.05	219	6,506.97
Blue	1,109	24,863.60	7,731	243,724.98
Grand total	283,496	1,932,893.75	3,711,873	24,416,356.80

¹ Silver fox included in black fox totals.

² Not including pelts from the Pribilof Islands.

NOTE.—The value of furs shipped from Alaska from 1912 to 1936 was \$42,903,225.



THE ALASKA RAILROAD

FIGURE 25.—Giant Kodiak Bear "Bagged" on Kodiak Island, Alaska for the State Museum of Illinois

square miles. The grizzly bears, close relatives of the Alaska brown bear, are found over most of the country. These two groups of bears are of outstanding interest to students of wildlife and big game hunters. They are fairly numerous and present information indicates that they are increasing in numbers as result of efficient law enforcement during the past 15 years, which included the prohibition of the sale of their pelts.

The moose closely follows the brown bear and grizzly bear in public interest. It is found throughout most of the timbered section of the Territory. Kenai Peninsula, east of Cook Inlet, has the largest specimens and an unusually heavy concentration of moose.

The white mountain sheep is found in fairly large numbers along almost the full length of the Alaska Mountain Range, over large sections of the Brooks Mountain Range, and in parts of the Chugach and Kenai Mountains on the south coast.

The caribou is the most numerous of all Alaskan big game animals. It is widely distributed throughout the high country of the interior plateau region, Alaska Mountain Range, and Brooks Mountain Range, and along the full length of the Alaska Peninsula. While the caribou is not as highly prized by big game hunters as are other animals, its occurrence in vast numbers, its migrations, and other equally interesting features add greatly to the pleasure of visiting sportsmen and tourists. The caribou constitutes an important source of food supply for residents and travelers in the isolated sections of the Territory. It in fact occupies a position in Alaska similar to that occupied by the bison in the early days of the Western States. Both sentiment and economic considerations dictate that it should be maintained in abundance.

Black bears are found throughout most of Alaska except in the treeless regions. Glacier bears are confined to the mountain ranges of the southern coast.

Mountain goats are present in the mountains of the southern coast eastward of Cook Inlet and north to the Wrangell Mountains.

The small Sitka deer, while abundant in southeastern Alaska, does not occur naturally in the other sections of the Territory.

Snowshoe rabbits and Arctic hares are abundant in most sections. The rabbit population is subject to distinct, regular fluctuations with the peak being reached about every ninth year.

There are extensive migratory waterfowl breeding grounds in the tundra and marshlands, particularly of the Arctic slope, Yukon Delta, Yukon Flats, islands of the Bering Sea, and the Aleutian Islands. Waterfowl bred in these areas contribute materially to the number annually reaching the States, particularly in

the Pacific, Rocky Mountain, and Mississippi River areas. The nesting grounds in Alaska are excellent, being well watered and possessing the equally valuable feature of remoteness. The human population of the main waterfowl areas is small, and there is little danger of any material increase in human encroachment in the immediate future.

It is known that damage is being done to valuable species of big game animals and game birds by wolves and coyotes. Wolves have always been present in the Territory, but coyotes have followed the advent of the white man. During the past 25 years the coyote has gradually extended its range and is now so firmly established that it threatens to invade any and all parts of the Territory wherever an adequate food supply exists. It has started to range over the wild duck and geese nesting area with serious results. Damage is also being done among the reindeer of the Bering Sea and Arctic coasts, particularly in the herds owned and controlled by native Eskimos who have become dependent on these animals for a large portion of their livelihood. It is important that well-organized and systematic control of this predator be established immediately where serious damage is evident and that investigations be carried on to determine the extent of damage and localities where this is serious and to evolve methods that can more satisfactorily be used to control the coyote where necessary. The bounty systems and the inefficient methods of the native trappers are insufficient and ineffective in keeping this menace within bounds. The situation has reached the point where trained personnel is necessary to assist the native trappers and to initiate the paid-hunter system in areas where it can be satisfactorily used if effective curtailment of the tremendous losses in wildlife resources that are constantly occurring through this source is to be brought about.

Protection Given Wildlife at Present

Previous to the present Alaska Game Law, enacted in 1925, game law enforcement in the Territory was a somewhat haphazard undertaking, divided among several Federal agencies delegated by Congress to administer inadequate laws that gradually became obsolete and impracticable of enforcement. Under these conditions both game and land fur-bearing animals were diminishing in numbers in many sections of the Territory. The intensive killing of beavers and the overtrapping of marten endangered the future of these valuable fur bearers. It was highly important that the Government exercise better guardianship of this last great stand of wildlife, to safeguard the interest of the large native population, and to assure adequate perpetuation of the various species. Leading conserva-

tionists, including those officially interested in the administration of Alaskan wildlife resources, felt that the job was not one for the Territory as the local government was not in a position to bear the heavy financial burden of necessary enforcement; also that the perpetuation of these natural resources involved many other features which the Federal Government was better fitted to administer. The administration of Alaskan wildlife resources was therefore placed under the Bureau of Biological Survey, United States Department of Agriculture. However, the residents of the Territory were not deprived of a voice in the administration of their wildlife affairs. The Alaska Game Law provides that the Secretary of Agriculture shall appoint a game commission composed of five members, of which four are required to be representative residents of Alaska, one from each of the four judicial districts, and not Federal employees. The fifth member is the chief representative of the Biological Survey resident in Alaska and the executive officer of the commission. The general administration of the Alaska Game Law is largely in the hands of the commission; also, the law provides that upon consultation with or upon recommendation from the commission the Secretary of Agriculture may issue suitable regulations governing the taking of game animals, land fur-bearing animals, and birds in Alaska. The commission meets annually at which time it proposes for action by the Biological Survey and the Secretary of Agriculture such regulations as seem advisable with respect to hunting seasons, bag limits, establishment of game and fur districts, and designation of areas as wildlife sanctuaries. It formulates general plans for regulatory work to be carried out under the direct supervision of the executive officer and makes recommendations for action by the Biological Survey on such matters as restocking of game lands, the introduction of new species, predatory animal control, and wildlife research. This administrative arrangement has proved satisfactory, and the Alaska Game Commission, through its untiring efforts, has helped to bring about a wholesome respect for the game laws and widespread cooperation in their enforcement from the residents of the Territory, both natives and white. Better enforcement of the Alaska Game Laws is now largely a question of increased funds to supply the needed personnel and equipment.

The Biological Survey, in close cooperation with the Commission conducts research work in the Territory with the objective of determining the best means of developing and maintaining the wildlife resources.

Refuges

To assure the preservation and restoration of various species of wild birds and animals, the following refuges have been established in the Territory:

Aleutian Island Refuge is a chain of islands with vegetation characteristic of the treeless Arctic plains, extending westward 1,200 miles from the Alaska Peninsula, that is maintained for the protection of native birds and game animals, the encouragement of fisheries, and the propagation of reindeer and fur animals. Blue foxes are farmed on many of the islands. Unimak Island of this group, having an area of 1,560 square miles, is important from the standpoint of perpetuating Alaska brown bear and caribou.

Bering Sea Refuge includes St. Matthew and Hall Islands as well as Pinnacle Islet and is situated about 220 miles north of the Pribilof Islands. Arctic foxes, represented mainly by the normal phase, which turns white in winter, are found in large numbers on this refuge. The rare and beautiful McKay's Snowflake is known to breed nowhere except on this refuge, and the Pribilof sandpiper breeds here more extensively than anywhere else.

Bogoslof Refuge consists of the small volcanic Bogoslof Islands in the Bering Sea, about 40 miles north of Unimak and Unalaska of the Aleutian Islands Refuge. It is noted for its large colonies of sea lions and as the home of millions of murres.

Chamisso Island Refuge consists of Chamisso Island and Puffin and other nearby rocky islets in Kotzebue Sound. This refuge includes one of the most important breeding rookeries of Arctic birds along the northwest coast of Alaska, including horned puffins, Palla's murres, Pacific kittiwakes, and Point Barrow gulls.

Alaska Railroad Refuge consists of certain areas along the Alaska Railroad between mileposts 40.5 and 252 set aside especially as refuges and breeding grounds for muskrats and beavers, but where all game birds and game and fur-bearing animals are protected.

Curry Refuge includes 14 square miles surrounding the Government hotel at Curry, Alaska, set apart as a bird, fish, and game refuge, fishing being regulated by the Bureau of Fisheries.

Forrester Island Refuge in the Pacific Ocean west of Ketchikan, including Forrester and Lowrie Islands, as well as Wolf and other adjacent rocks, is the breeding place of various kinds of sea birds.

Hazy Islands Refuge lies in southeastern Alaska, about 100 miles north of Forrester, and is a breeding place for numerous sea birds.

Nunivak Island Refuge is located in Bering Sea, off the west coast of the mainland. This area was originally set aside for the use of the Department of Agriculture in conducting experiments in the crossing and propagation of reindeer and native caribou, and as a refuge for native birds and wild game and fur-bearing animals. The Biological Survey has transferred and now maintains on this refuge a herd of about 30 musk-

oxen reintroduced into Alaska from Greenland in 1930. Reindeer transferred to the island in connection with the cross-breeding experiments have increased to about 6,000 animals which will be of direct benefit to the natives.

St. Lazaria Refuge is located at the entrance to Sitka Sound, about 30 miles west of Sitka, and is the breeding place of certain sea birds.

Semidi Islands Refuge is located in the north Pacific Ocean, southeast of the Alaska Peninsula, and includes the islands of Aghiyuk, Chowiet, Kateekuk, Anowik, Kiliktagik, Suklik, Aghik, Aliksemit, and South Island, known as the Semidi Island group. Colonies of puffins, auklets, and petrels inhabit this refuge.

Tuxedni Refuge embraces Chisik, Egg, and other small islands in Tuxedni Harbor, Cook Inlet, and was set aside as a breeding ground for native birds.

Hazen Bay Migratory Waterfowl Refuge, situated in Hazen Bay, north of Nelson Island near the north entrance to Baird Inlet, off the west coast of Alaska, was declared a refuge for migratory birds and other wildlife by Executive order dated December 14, 1937. The refuge comprises the islands of Nunivakchak and Krigegak. Black brant, white-fronted, Emperor, and Little Canadian or cackling geese nest on these islands, as well as swans, glaucous gulls, greater scaup ducks, old squaws, and large numbers of eider ducks.

In addition to the above refuges established by the Biological Survey, the Afognak Island Fish and Forest Reservation, administered by the Bureau of Fisheries and the Forest Service, was designated as a sanctuary to protect game and sea animals and the salmon fisheries in the adjacent waters. This island is of great value as a sanctuary for the exceedingly interesting Kodiak bear. Trapping and hunting of game animals other than large brown and grizzly bears on the island are permitted in accordance with the Alaska Game Law.

Furthermore, wild animals and birds are especially protected by the National Park Service in the Mount McKinley National Park, Katmai National Monument, and the Glacier Bay National Monument. In addition to the sanctuaries for wildlife provided through definitely established refuges, national monuments, and the national park, extensive areas have been closed by regulations under the Alaska game law to the hunting or taking of all species of game and fur-bearing animals and game birds or for the protection of certain species.

The total area now (1937) in definitely established wildlife sanctuaries in the Territory is 15,436 square miles.

Problems and Recommendations

Investigations and Surveys

Little is known regarding the various game ranges, fur-producing regions, and the vast breeding grounds seasonally occupied by ducks, geese, and other migratory waterfowl. Alaska's share in providing incubation facilities for migratory waterfowl probably has never been fully appreciated. This dearth of information is not astonishing in view of existing pioneer conditions and the large size of the Territory. Investigations of wide scope must of necessity play a leading part in any program here for many years to come. They should be of such nature as to indicate the best means of maintaining and developing the wildlife resources of the Territory and at the same time produce information of more general scientific interest.

The economic phases of the study should cover such matters as supply of fur, methods of trapping and handling, regulatory laws and their effect, protection for fur bearers, marketing, and the commercial aspect in general. Included in this must be a study of possibilities to improve the economic situation of the natives through improvement of the fur resource.

Fur farming in Alaska is an industry of comparatively recent origin, and less authentic information is available concerning it than for any other branch of animal husbandry. Surveys are needed of physical conditions of fur farms, species, and numbers of breeding animals on islands and pen farms, annual production of pelts, and methods of marketing. This survey would be made for the purpose of obtaining a better knowledge of the business so that proper action may be taken to expand and develop the industry along intelligent lines.

There are several pressing scientific problems in fur farming which must be solved before the industry can expand substantially. Some of these are peculiar to Alaska and research work done elsewhere does not meet the local needs. At least one, and preferably more, properly equipped fur-farming experiment stations should be established and maintained in Alaska for work on breeding, feeding, parasites, and other important matters in connection with island and pen production of fur. The Territorial legislature recently authorized the establishment of a fur-farming experiment station, and a site near Petersburg has been selected. More funds than were appropriated will be needed properly to equip and operate this station.

A survey of all forms of wildlife should be undertaken that eventually will extend over the entire Territory. The first step should be the mapping of the broad vegetative cover types, preferably by means of

aerial photographic surveys and subsequent ground work. The survey should cover distribution and numbers of each species, food and cover resources and requirements, feeding and breeding habits, diseases and predators. This wildlife study should necessarily be integrated with studies of other resources and interests in order to permit of drafting and carrying out a coordinated plan of development and use that gives due recognition to all interrelated or conflicting matters. Agriculture, livestock grazing, reindeer raising, and commercial forestry, being extensive land use pursuits, are other types of land use that have a profound bearing on wildlife management.

Food habits and other studies should be made to determine policies and administrative action for the control of predatory species. Particular attention should be given to the wolf and coyote and their effect on wild game and the reindeer industry, depredations of brown bear on livestock, the relation of beavers to salmon spawning streams, and the bald eagle in relation to the salmon and fur-farming industries.

Elk, buffalo, and other big game species have been introduced into Alaska. More intensive studies than have hitherto been possible should be made of the management problems that arise in connection with these species which are new to the Territory.

At fairly regular intervals of about 9 years deadly epizootics appear among the rabbits, grouse, and ptarmigan of Alaska, reducing them nearly to the vanishing point. Gradually the survivors build themselves up to large numbers only to be reduced again at the end of the regular period. During the years of abundance these rabbits and birds are primarily responsible for large fur yields, the number of foxes, lynx, marten, and ermine fluctuating downward and upward in agreement with the changes in the rabbit and grouse population. Rabbits and upland birds are also important factors in the meat supply of the natives and white settlers.

An intensive research project should be initiated to determine if possible the cause of these recurrent wildlife disappearances. A solution of the mystery might go a long way towards maintaining the supply of fur bearers at a higher level.

Investigation of the nature of diseases and measures for control should be undertaken in Alaska to cover all forms of wildlife and especially the species of economic importance. Particular stress should be placed on the parasites harmful to Alaska's wildlife, especially parasites affecting fur bearers and game. Rabbits and grouse are heavily parasitized at times, and caribou and reindeer are seriously affected by warble flies.

It is thought advisable to make an investigation of the desirability and feasibility of establishing land re-

serves for Alaska natives comparable to reserves of northwestern Canada in which the natives hold exclusive trapping privileges.

Legislative

The present Alaska Game Law, which has been in effect for 12 years with but minor amendments, has in large measure proven to be a satisfactory instrument for the administration of the wildlife of the Territory. When the studies are started on which game management plans for huge areas are to be based, the need will doubtless be shown for additional legislation to implement the supervision of these areas, but no recommendations of that kind can be made at this time.

Territorial legislation should be enacted for a new and better system of wolf and coyote control where these animals are demonstrated to be a serious menace to reindeer and wildlife. Costly experiments with the bounty system over a period of many years in Alaska have failed to bring satisfactory results. If bounties are to be continued the law should be amended to eliminate some of the objectionable features. It is suggested, however, that Territorial legislation be enacted to permit the initiation of a paid-hunter system for wolf and coyote control in certain areas in Alaska where this system can be satisfactorily used.

Administrative—Jurisdictional

At the present time there are only 12 game wardens to cover the 586,000 square miles embraced in the Territory. Each man thus polices an area of about 50,000 square miles. At least 6 more wardens, together with headquarters buildings and travel equipment, are needed to achieve better law enforcement.

Airplane transportation can contribute immeasurably to better law enforcement. Aerial travel in Alaska is more commonly employed by all classes of residents than in any other part of the United States, owing to vast distances and inadequate ground transportation. If the law enforcement officers are to keep step with the movements of hunters, trappers, and fur-dealers to discourage violations of the laws, they, too, must take to the air. This need has so far been partially met by the charter of privately owned planes, but this method is too inflexible to provide efficient patrol service.

The Alaska Game Commission should be provided with two airplanes. The operation of these airplanes by the Commission would effect real economy, as has been thoroughly demonstrated by a record of Commission expenditures during the past several years. The many landing fields now being built and the thousands of lakes and rivers available to pontoon planes make every part of the Territory accessible during the

summer season. During the winter season the airplanes are equipped with skis and can land practically anywhere.

Recommendation is made that a predatory animal hunter system be installed in those sections of the Territory where control of wolves and coyotes is badly needed and where the system is practicable of application. In areas where the employment of paid hunters is not practicable, instructions and demonstrations should be given to natives and other local trappers in the best methods of taking these predators.

Administrative measures should be taken to improve conditions in the waterfowl nesting areas following the establishment of a work program based on adequate investigation.

Alaska has areas ideally suited to the propagation of large numbers of valuable game animals, game birds, and fur bearers which are now barren because encompassing glaciers, impassable mountain ranges, bodies of water, or other natural features have offered insurmountable obstacles. These areas should be stocked with native wildlife after study of the local conditions indicates the kind of animals to be transplanted.

Well-located refuges providing sanctuary for valuable species of wildlife do much toward maintaining the game population throughout the entire range. The establishment of additional and the enlargement of existing wildlife refuges and National Parks and Monuments should be given immediate consideration.

The natives should be given instruction that will enhance their returns from the game resources and at the same time give them a realization of the direct value they receive from game conservation measures. An educational program of this kind should be a co-operative project involving the Biological Survey, Alaska Game Commission, and Office of Indian Affairs.

Under present conditions there is likelihood that reindeer and caribou will interbreed to such an extent as to endanger the preservation of the caribou as a species. The supervisory officers of the reindeer herds

and the Game Commission should take active measures to keep these animals apart on the range.

Fur farming offers a means of conserving wild fur bearers as well as the possibility for supporting Alaska families. It should be encouraged particularly by a scientific study of the industry's major technical problems.

Better protection of the sea otter in the waters of the Aleutian Islands and elsewhere in Alaska is needed. Based on data gathered in the past few years the contention that these animals are not pelagic but are closely confined to the shores, well within the 3-mile limit, seems to be substantiated. Since the Aleutian Islands are under the jurisdiction of the Department of Agriculture, some satisfactory arrangement might well be made whereby that Department is assigned some responsibility for the protection of these animals. Recommendation is made to that effect.

The areas selected for wildlife and general recreational use should be placed under game and recreation management plans and given the special treatment as regards laws, regulations for use, maintenance of game, fur, and fish supplies, facilities for accessibility, and administration that the conditions on each particular area demand. A determination of the treatment to be applied must rest on a solid foundation of field study and investigation.

The vegetative cover of the greater part of the Territory is subject to extensive and repeated fires, owing to a light rainfall and a fairly high temperature during the summer months. These fires do great damage to all forms of wildlife. They destroy the food and cover of game animals, consume the nests of the young of upland birds and waterfowl, and kill both fur bearers and the rodents on which fur bearers subsist. The vast area of open public domain has no organized fire protection and many millions of acres have been swept by fires one or more times during the past 40 years. Recommendation is made that an organized program for fire protection on the public domain be established at once.

FOREST RESOURCES¹

Introduction

Present conditions in Alaska with respect to its organic resources are comparable to those which prevailed in the West 60 or more years ago before the great tide of western settlement was well under way. Despite an occupancy covering more than three-fourths of a century, the Russians had left the country in much the same condition as they had found it—an unbroken wilderness. American sovereignty brought no abrupt

¹ Prepared by a group composed of L. F. Knelp, B. Frank Heintzman, and Irvine T. Hail, Forest Service; George D. Bixby, Department of the Interior; Thomas C. Havell, General Land Office; John D. Coffman, National Park Service; J. Donald Lamont, Office of Indian Affairs. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

change. For three decades the white population was inconsiderable, and it was not until the great gold rushes, around the turn of the century, that white men became well dispersed over the country. The present population, white and native, equals only one person to 10 square miles, most of them concentrated in coastal towns and villages and employed in industrial enterprises involving little land use.

In interior and Arctic Alaska, however, the white occupation has brought continuous devastation by fire of the timber, grass, and tundra cover which is needed to support the varied and abundant existing wildlife and to provide a basis for future increased settlement. Some serious deterioration of range lands on portions of the Bering Sea coast due to overgrazing by reindeer has also occurred.

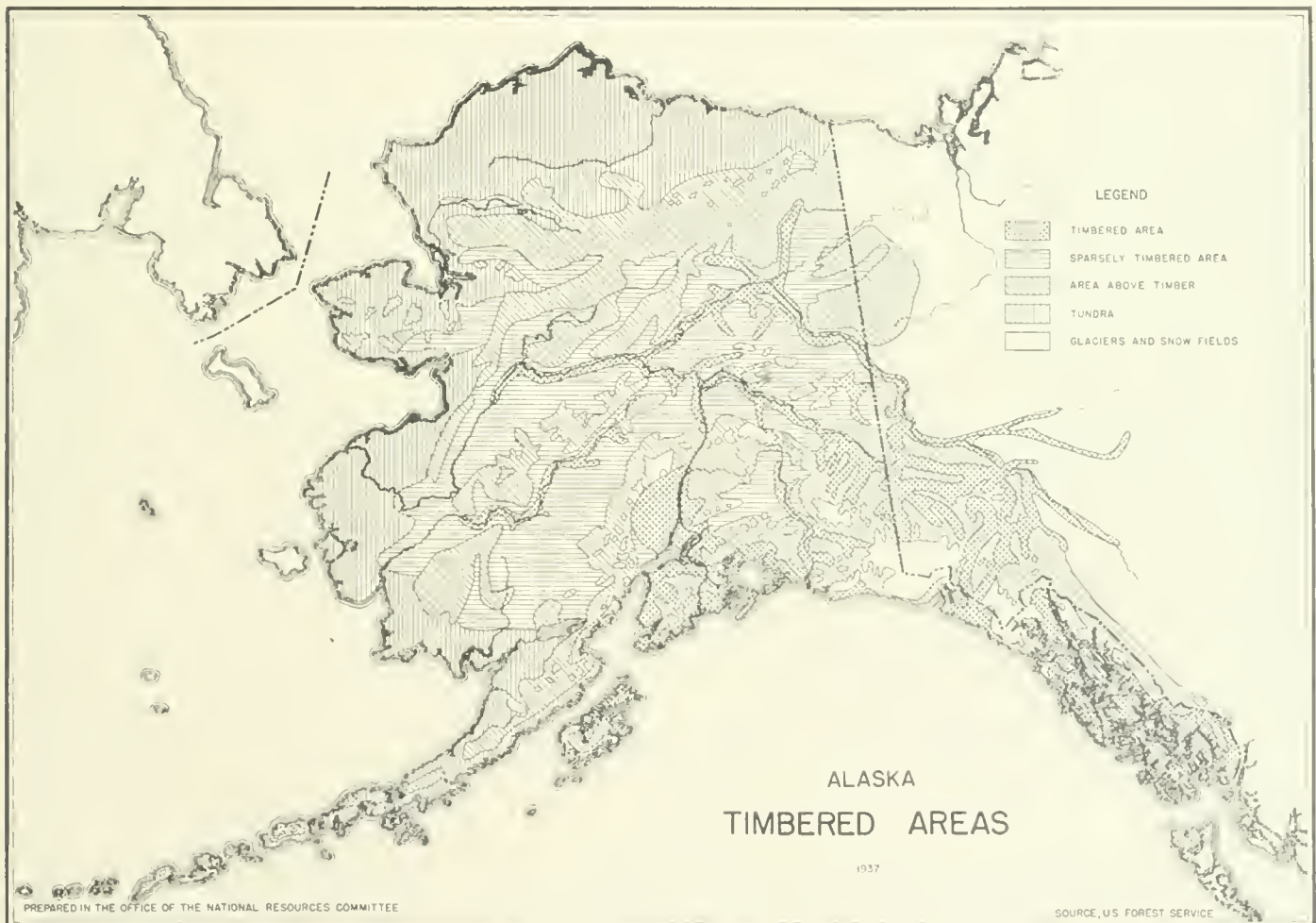


FIGURE 26

Available General Data

In spite of this long period of white occupancy, Alaska has never been adequately mapped, especially as regards the vegetative cover types. Some early reports² show the vegetative types in several broad classes, but this mapping is in itself largely the result of assumption and guess by competent observers rather than the result of actual surveys. Figure 26 shows a rough sketch map of the important vegetation types of Alaska. The estimated areas of the zones in which each of the principal cover types predominates are given below. These estimates do not exclude barren areas and some grass, brush, and muskeg areas within the outside boundaries of the major cover zones:

	<i>Square miles</i>
Coastal forest (western hemlock-Sitka spruce) zone..	43,060
White spruce, birch forest zone.....	342,409
Tundra zone.....	150,000
Alaska Peninsula-Aleutian Island grassland zone.....	55,415
Total of main area.....	590,884

In 1926 and 1929 the Navy Department covered by aerial survey 19,000 square miles of national forest land in the important coastal forests. The resulting maps have been of inestimable value in the study of timber, water power, and other resources, but they are still incomplete even for the whole of this small fraction of the Territory.

The records of the General Land Office of the Department of the Interior show the gross area of the Territory of Alaska and the present status of the lands therein to be as follows:

	<i>Acres</i>
Area of the Territory.....	378,165,760
Present Status:	
National forests.....	21,346,221
National parks and monuments....	5,801,978
Reserved for power sites and with- drawn for power-site classifica- tion.....	214,471
Military and Naval Reserves.....	21,000,000
Lighthouse reservations.....	15,000
Indian and native reservations ¹ ...	820,000
Game and bird reserves.....	4,039,304
Matanuska Valley Colonization Project.....	253,440
Patented, under various public land laws.....	266,500
	53,756,914
Vacant, unappropriated and unreserved.....	324,408,846

¹ Includes approximately 328,000 acres temporarily withdrawn by Department of the Interior October 30, 1936, for use and benefit of the Eklutna Industrial School.

² See map facing title page taken from Professional Paper No. 45, U. S. Geological Survey.

NOTE.—In addition to the above withdrawals and reservations the Territory's right to an estimated 21,445,209 acres for educational purposes will attach upon survey.

The net area of the withdrawals and reservations is necessarily somewhat less than shown above for the reason that it is impracticable to determine the absolute net acreage due to overlaps.

Appraisal of Present Resources

In general the forests of Alaska which will contribute to the timber supply of the Nation are confined to a narrow mainland strip and adjacent islands, extending for 800 miles from the British Columbia boundary northwest to the entrance of Cook Inlet. These forests are an extension of the mesophytic forests of the Oregon and Washington coast and consist of heavy, dense stands of conifers, principally western hemlock, and Sitka spruce intermixed with some western red and Alaska cedar. Aside from this coast-forest area Alaska has the vegetative cover types common to the extreme northern portion of the American Continent. The Arctic Ocean drainage areas and the littoral of Bering Sea for a width of 100 to 150 miles, are almost wholly treeless, the cover being tundra. The Alaskan Peninsula and its extension, the Aleutian Island chain, are grass-covered. The remainder, which constitutes the major portion of the Territory, has (1) a patch-like arrangement of types embracing coarse grass, brush, tundra, and peat moss, all of which may have some stunted black spruce of pole size; (2) scattered limby white spruce, white birch, and cottonwood intermixed with brush; (3) fairly dense forest stands, largely white spruce and Alaska white birch, with northern black cottonwood a frequent associate. Stands embraced under (2) and (3) constitute the Interior Forest.

The Interior Forest

In the interior, stands of sufficient density to be classed as forests are common but seldom continuous over extensive areas. The forest zone of the main area of the Territory extends north to the south slope of the Brooks Range and west to Norton Sound, Bethel on the Kuskokwin River, and the base of the Alaska Peninsula. No satisfactory estimate of the actual area is available, but a conservative guess places the extent of the combined dense and open woodland stands at between 64 to 80 million acres. The average stand per acre is probably about 7 cords, giving an estimated total volume of some 500 million cords. Nothing is known about the quantity of usable material available in the very extensive type consisting of scattered trees and brush. The main forest occupies the better-

drained soils of valley floors, benches, rolling ground, and the lower slopes, seldom getting above an altitude of 2,500 feet and often held to much lower limits because of adverse local conditions. The wet lowlands are predominantly occupied by black spruce rarely exceeding 6 inches in diameter with intermixed stunted tamarack, white spruce, and Alaska white birch. The trees often occur as scattered individuals or in small groups.

Growth in the interior forest is very slow and even under good protection and management may fall short of fully supplying timber needs of the future local population. Timber cutting so far has been confined to supplying material for local purposes, chiefly mining timbers and cord wood for fuel, and while the aggregate so far removed has been fairly large, it is only a negligible percentage of the total available. At the same time, fires and heavy cutting have about

exhausted the supply of readily accessible material around some of the settlements.

The per capita consumption of timber in interior Alaska is high even for a frontier country. One of its principal uses is for fuel during the long and intensely cold winters. Wood-burning river steamers and mining operations also make unusually heavy demands. Small sawmills operating at Fairbanks and elsewhere produce sawn material for local use. It seems reasonable to suppose that little of the interior timber will ever come into the general timber-products markets though birch trees of the best quality are suitable for cabinetmaking and may be removed from some of the more accessible areas, such as around the head of Cook Inlet. Local activities and especially the future homemakers will need increasingly large quantities of forest products and the interior forests are of inestimable value in the development of the interior region.



FIGURE 27.—Tongass National Forest, Southeastern Alaska

PHOTO BY U. S. FOREST SERVICE

Although actual utilization has been small, the interior forests of Alaska have suffered considerably through man-caused fires. Almost all the fires in Alaska are man-caused and are due in large measure to a lack of appreciation of their damaging effects on the vegetative cover and the enterprises which this cover helps to support. Fires used in land-clearing operations for cabin sites, homesteads, and placer mining are often set with no thought of preventing their spread to the surrounding wild lands.

Coast Forest

This class of forest growth constitutes the commercially important stands of the southern coast. It prevails throughout and is largely confined to southeastern Alaska and the Prince William Sound region.

The coast forest is predominantly a mixed stand of western hemlock and Sitka spruce. Western red cedar and Alaska cedar are frequently associated with the two principal species and any one of the four may occasionally occur as a pure stand of small extent. The forest has an almost tropical density of trees and underbrush. In the usual mixed stand hemlock, with some cedar, forms a dense main cover, and this is overtopped by trees of the more light-demanding spruce, occurring singly or in small groups. Bushy saplings of the shade-resistant hemlock and cedars, various species of blueberry (*Vaccinium*), and devil-club (*Echinopanax horrida*), and other shrubs, form a dense understory. Down timber, which decays slowly because of almost continuous saturation from an abundant rainfall, occurs in profusion, and a carpet of moss covers the decaying logs and the forest floor to a depth of 6 inches or more.

The forest extends from the edge of tidewater to altitudinal limits of about 2,750 feet in the southern and 2,000 feet in the northern sections. Commercial timber gives way at approximately 1,500 feet to stands of dwarfed, limby trees, which are designated "sub-alpine" and classified as noncommercial. With steep slopes being the rule, the commercial forests thus occur largely in fairly narrow bands along the shore lines. Good timber rarely extends inland more than 5 miles except along the few large stream valleys. A vast network of sheltered navigable waterways renders a large portion of the area readily accessible and perhaps as much as 75 percent of the timber of usable quality lies within 2½ miles of tidewater.

The forests of commercial value are broken into large blocks by extensive noncommercial "scrub" areas, of somewhat dwarfed timber, and by "muskegs" of peat which carry only isolated small trees.

Decadent trees with dead spike tops are a conspicuous feature of the noncommercial scrub and cedar

areas and the overmature hemlock-spruce stands. Few spike tops occur in the extensive mature and piling-sized stands of hemlock and spruce.

Timber Volumes

Most of the standing timber of the coast forest is included in the Chugach and Tongass National Forests, which together comprise the greater part of the land area of the southern coast from Portland Canal to Cook Inlet. The Chugach National Forest centers in the Prince William Sound region and the Tongass comprises the greater part of southeastern Alaska. The net publicly owned area and the estimated timber stand by species of each forest are as follows:

Species	Chugach National Forest		Tongass National Forest		Total	
Area.....	4,800,000 acres....		16,546,000 acres....		21,346,000 acres.	
	M feet B. M.	Per- cent	M feet B. M.	Per- cent	M feet B. M.	Per- cent
Western hemlock ¹	4,220,000	68	58,000,000	74	62,220,000	73
Sitka spruce.....	1,900,000	30	15,800,000	20	17,700,000	21
Western red cedar.....			2,350,000	3	2,350,000	3
Alaska cedar.....			2,350,000	3	2,350,000	3
White spruce.....	100,000	2			100,000	
Cottonwood.....	30,000				30,000	
White birch.....	10,000				10,000	
Total.....	6,260,000	100	78,500,000	100	84,760,000	100

¹ Includes some mountain hemlock.

The principal timber-bearing regions adjacent to but outside of the two national forests contain not to exceed 1,500,000 M feet board measure, giving the Coast Forest region an estimated total volume of 86,260,000 M ft. board measure.

Among the timbered areas outside the national forests is Annette Island Indian Reserve of 86,740 acres in southeastern Alaska. Its timber stands have not been surveyed but the total volume is thought to be at least 300,000 M feet of timber of the usual Coast Forest species and quality. This timber now furnishes a log supply for the sawmill operated for home use by the residents of the native town of Metlakatla situated on the north end of the island. When better markets develop for Alaska forest products this Indian timberland can supply considerable quantities of material for sale.

The timber estimates for the Chugach Forest are based on poor data and are thought to be too high, but the Tongass estimates are sufficiently dependable for extensive planning purposes. The latter forest is better developed and more widely used and its timber volume has had much more "sampling" in the form of pulp-timber cruises.

In round numbers 3,000,000 acres of the Tongass Forest carry timber of commercial value. The estimated commercial timber volume per acre is thus about 26,000 feet board measure. The Tongass, in addition, has perhaps 1,000,000 acres of timber of marginal value, which is now classed as noncommercial but may sometime acquire value. Another 1,000,000 acres carry timber of no present or prospective future value and is disregarded in all volume estimates.

Although the average stand per acre for the commercial forests of the Tongass as a whole is about 26,000 board feet, individual large logging units frequently have volumes of 40,000 to 50,000 board feet per acre.

The Tongass has far greater present and potential economic value than the Chugach Forest because of better quality and greater volume of its timber resources, a shorter haul to the general markets, and better water-power resources for timber-using industries.

Character of the Forest

The forest can be roughly grouped as to age and condition into three classes as follows:

The Climax Forest

This includes the stands in which an old, overmature, even-aged stand composed largely of spruce has broken up in the natural course of forest succession into the typical climax forest type composed of many ages and a mixture of hemlock and spruce. In the advanced stages of this transition the overstory consists of about 75 percent hemlock and 25 percent spruce by volume, the understory being composed almost entirely of hemlock. In this extensive forest region there are stands showing this replacement in all its stages, but those in which it is well advanced are most numerous. In such cases the overmature timber is of quite open density and is composed of overmature hemlock and of scattered larger spruce. The trees of the younger age class range from 8 inches to 2 feet in diameter, and are tall, clean-boled, and sound. The average volume per acre is approximately 25,000 board feet.

This combination of overmature and young timber constitutes about half of the commercial timber of the region and must be relied upon to furnish a corresponding portion of the wood supply for pulp mills.

Mature Timber

Mature timber includes stands which have not yet begun to open up and let in the young growth. The trees range in diameter from 2½ to 4 feet and are of excellent quality. The average yield is from 30,000 to

40,000 board feet per acre. Although not so prevalent as those of the climax forest, extensive areas of this mature timber are scattered throughout the region. They will be an important source of pulpwood supply.

Young Growth

Stands of thrifty, even-aged young growth, varying from a few acres to several square miles in size, are found throughout the region. These evenaged stands are the result of fires, windfalls, landslides, or cutting, and are composed of a much larger percentage of spruce than the virgin forest which they supplanted. The volumes on average sites will vary from about 9,000 cubic feet at 80 years to over 16,000 cubic feet at 150 years. Timber of this class is excellent material for pulp. It covers extensive areas and constitutes perhaps 20 percent of the timber volume of the region.

Commercial Types and Species of Coast Forest

Western Hemlock (*Tsuga heterophylla*)

The western hemlock type is the prevailing commercial timber type. The predominating hemlock has as associates a varying percentage of Sitka spruce, western cedar, and Alaska cedar. Stands typical of millions of acres contain about 75 percent western hemlock, 20 percent spruce, and 5 percent cedars.

The mature tree commonly reaches an average size of from 3 to 4 feet in diameter and from 100 to 140 feet in height. The trees are usually sound when young, but when they reach a diameter of 3 to 3½ feet, by which time they are largely overmature, they are affected by disease, and rapidly develop spike top and a serious heart rot. The greater part of the log output, in stands where these defective trees occur, comes from the intermixed younger timber, which carries little defect. Hemlocks occurring on the poorest sites and as scattered trees in spruce stands frequently have deeply fluted lower trunks, but in the commercial forests as a whole fluting is not an important factor.

Western hemlock is an excellent wood for a great variety of uses. It is moderately strong, light in weight when dry, fine-grained, light in color, and almost tasteless and odorless. It is hard enough to stand up well under heavy wear, although sufficiently soft to be worked easily. It is especially good for flooring, and is satisfactory for many other kinds of construction material from heavy timbers to inside finish. It is superior to eastern hemlock as a pulping wood and is in good demand for boxes and crates.

Hemlock is used extensively as piling for the construction of fish traps, which are operated in the coastal waters of Alaska by the salmon canning industry. Many of the sticks cut for this purpose are from 90 to 130 feet in length. Hemlock ties are now sawn in

quantity by the local mills for use on the Alaska Railroad. Very little hemlock lumber is being cut in Alaska because it cannot profitably be shipped to the general markets in competition with Puget Sound hemlock. The local consumption is increasing, however, as the merits of hemlock lumber become better known.

The high value of western hemlock in pulp and paper manufacture has been fully established by the mills of Oregon, Washington, and British Columbia. It is the foundation of the extensive bleached and unbleached sulphite pulp industry which has been developed there in the last 10 years. A large proportion of the bleached output goes into rayon and cellophane, which require the very highest grades of pulp. As unbleached sulphite and mechanical pulp, western hemlock also provides most of the principal raw material for the newsprint industry of that region.

The outstanding proportion of hemlock used by the pulp mills of the Pacific coast is shown by the following preliminary figures, subject to correction, from the Bureau of Census on the pulpwood consumption of Washington and Oregon in 1935:

	<i>Cords</i>
Hemlock.....	1, 148, 453
White fir	174, 075
Poplar.....	4, 859
Spruce and others.....	152, 197
Slabs and mill waste.....	214, 099
Total cords	1, 693, 683

Sitka Spruce (*Picea Sitchensis*)

Sitka spruce predominates in the type which carries its name. The stands in the type are sometimes pure spruce, but more frequently have various percentages of hemlock in mixture.

This is not an extensive type, and the aggregate volume of timber is small in comparison with that of the hemlock-spruce type. It occurs in patches, seldom exceeding 80 acres in extent and usually much smaller. It is ordinarily the first coniferous type to be established on new ground, and hence is common on lands being uncovered by retreating glaciers, on alluvial deposits along valley floors, and at the outlets of large rivers, and on mineral soil exposed by landslides on steep slopes. It is not confined to such sites, however, and is frequently found on well-drained lower slopes. It is especially prevalent on limestone formations, perhaps because of good drainage.

The west coast of Prince of Wales Island and the numerous adjacent small islands contain an outstanding number of spruce areas with exceptionally large trees. These areas are supplying most of the present sawmill requirements of southeastern Alaska, as the trees yield a high percentage of clear lumber that can be exported

profitably. Such stands are too limited to support a large sawmill industry cutting for the general markets, but they are of great value in maintaining a substantial local milling industry needing a certain amount of export business for successful operation.

The average mature Sitka spruce tree is about 5 feet in diameter and 160 feet in height, but trees with a diameter of 7 feet and a height of 200 feet are common. The largest known spruce tree in Alaska is 14 feet in diameter at a point 6 feet from the ground. The boles are well formed above the pronounced butt swell characteristic of this species and are clear of branches well toward the tops. In the usual mixed forest the trees of the faster-growing and more light-demanding spruce are larger in diameter than the hemlocks and exceed them in height. The large size and straight, clean, smooth-barked trunk make the spruce a very impressive tree. It is commonly sound and straight-grained, but on exposed sites is much subject to wind shake and spiral grain. The most common defect of overmature trees is butt-rot.

Spruce is the principal saw-timber tree of this region and is manufactured into all of the usual forms of lumber and into airplane stock. It is an excellent box material, and low-grade lumber is remanufactured into packing cases for the Alaska salmon industry.

The export of high-grade spruce lumber from Alaska started during the World War, when much airplane stock was furnished, and since then constantly increasing amounts of clear spruce for special uses have been sent out by the local mills and transshipped through Seattle to American and foreign markets.

Sitka spruce is an excellent all-purpose pulping wood. It compares very favorably with white spruce, the standard pulpwood of eastern North America.

Sitka spruce is less used than hemlock for pulp in the Pacific Coast States, because of the keen competition of the sawmills for spruce logs and the suitability of the less expensive hemlock for most of the grades of pulp manufactured there. It is unlikely that much competition for spruce will develop in Alaska between pulpmills and sawmills, as the mixed hemlock-spruce forests are preponderantly hemlock and will never be attractive for an extensive spruce sawmill development.

Western Red Cedar (*Thuja Plicata*)

Western red cedar occurs in this region only in the southern half of southeastern Alaska, Frederick Sound marking its northern limit on the Pacific coast. It reaches its best development below an elevation of 500 feet. Mature trees have an average diameter of 5 to 6 feet and a height of 100 to 125 feet. They are limby, heavily tapered, and subject to severe heart rot. Trees of pole size are well-formed and sound.

The best trees are those occurring as scattered individuals or in small groups in stands of hemlock and spruce. The average tree of the pure cedar type of forest is somewhat poorer in quality but sufficiently good to be classed as merchantable. The open stands of cedar and other species found so commonly on the swamp soils are uniformly of poor quality and are not considered merchantable, the trees being short, limby, and defective.

The western red cedar of Alaska is excellent shingle material because of its close grain, deep color, and fine texture, and is considered primarily valuable for this use. It will also produce short boards and strips for specialized uses; but knots, seams, and heart rot preclude the manufacture of any appreciable percentage of the logs into siding and other high-grade lumber. Many of the younger trees are suitable for telephone poles. The cedar of Alaska will probably be utilized in fairly large quantities after the virgin cedar stands of Washington and British Columbia have been depleted.

Alaska Cedar (*Chamaecyparis Nootkatensis*)

Alaska cedar is found as far west as Prince William Sound. It occurs from tidewater to the altitudinal limits of tree growth, but is most prevalent and reaches its best development at elevations between 500 and 1,200 feet.

The best trees are found in small groups scattered through the hemlock and spruce forests. On the extensive areas where cedar predominates the trees are in the main of small pole size and produce a very light volume per acre, but small patches of excellent cedar timber are found occasionally within these areas. These good stands are seldom more than 10 acres in extent, and have trees ranging from 18 to 36 inches in diameter and 75 to 90 feet high.

Trees over 3 feet in diameter quite generally carry much heart rot in the first 16-foot log. Extensive bark-peeling operations of the Indians in earlier days have produced many "cat faces" and much vertical check, rendering one-third to one-half of the first log useless. Spiral grain and small knots are quite common. The best trees are those about 24 inches in diameter.

Little Alaska cedar is now cut, as it is not well known in the markets. Its qualities and field of usefulness have not yet been studied carefully, but results obtained in local use indicate a high value for specialized purposes. Eventually a good demand should develop for it. It has a very fine texture, is easy to work, has a bright yellow color, takes a beautiful satin finish, and is extremely durable. It is considered valuable for pattern making, furniture, toys, turned articles, and cabinet work. A pronounced odor which repels moths makes it valuable for clothes closets and chests. It has

long been used locally for boatbuilding and for telephone poles. Battery separators are made of it in British Columbia. While costly to log and mill because of its scattered occurrence in the forest and the amount of defect that must be handled, specialty uses will doubtless make its utilization profitable.

Northern Black Cottonwood (*Populus Trichocarpa Hastata*)

Cottonwood occurs in quantity only on the valley floors of the few large mainland streams.

Mature trees reach an average diameter of 3 feet and a height of 80 to 90 feet. Black heart and black knots are common on mature trees, but extensive areas of immature trees of excellent quality are found. Cottonwood in this region has a prospective use for pulp of certain grades. The small supply in southeastern Alaska might be augmented from the Canadian sections of the same river valleys.

Scrub

The term "scrub" is used to designate the open stands of somewhat dwarfed, defective trees, with dense undergrowth of blueberry and other shrubs, which occupy the soils more poorly drained than those of the forest types previously described, but better drained than those of the muskeg type. Scrub and muskeg are widely distributed and together cover perhaps one-fourth of the total timber area of the region.

The timber of the scrub type is not considered as having any commercial value. It may, however, be drawn upon in the distant future for pulpwood. It is safe to assume that not less than an average of eight cords per acre could be obtained from the total area of 1,000,000 acres or more of this type in southeastern Alaska.

Silvicultural Features

Sitka spruce, the most important species of this region, is a rapidly growing, light-demanding tree. It reaches its best development when growing in mixture with other species, which it always overtops. Western hemlock, its principal associate, has fair growth properties and is shade-enduring, a quality enabling it and the more light-demanding spruce to form very dense mixed stands. The two are an excellent combination for the production of pulpwood, and the aim of the forester will be to reproduce both species, but increase the proportion of the more valuable spruce to the point, now unknown, where its quality begins to suffer.

Clear cutting and the leaving of seed trees is the logging method used in this region to achieve the above result. Studies of cut-over saw-timber areas plainly show that such logging is followed by ample reproduction through natural reseedling and that the percent-

age of spruce in the second crop may reach 50 percent by volume. Clear cutting is also desirable because spruce and hemlock are shallow-rooted trees liable to excessive windthrow under a selective cutting method. Windthrow danger also requires that seed trees be not left as scattered individuals but in fairly large groups.

Studies of yield in the forests of southeastern Alaska indicate that the rotation should be about 75 to 80 years and that the crop produced in this period will have a volume per acre at least twice the average volume now found in the virgin commercial forest.

Estimating the commercial stand of virgin timber on the Tongass Forest and public domain of southeastern Alaska at 80 billion board feet, and allowing 80 years as the rotation period during which this virgin timber may be entirely removed under sustained-yield forest management, approximately 1,500,000 cords of wood of 600 board feet each can be taken from the forest each year in this period. This output is sufficient to produce more than 1,000,000 tons of newsprint a year. As the new crop of timber in which cutting will begin after 80 years will have at least twice the volume per acre of the virgin stand, a plan of forest management based on a sustained yield of 1,500,000 cords of pulpwood should be very conservative.

Forest Management Policy

The following is a condensed statement of the main objectives and general policies which have been established by the Forest Service for the management of the timber resources of the Tongass National Forest. They provide for a continuous and adequate supply of timber for wood-using plants that may be installed in the region. The establishment of such plants will in turn foster the permanent development of the Territory and allow of a sustained contribution to the Nation's supply of timber products.

Object of Management

The management of the timber resources of the Tongass National Forest has as its prime objectives:

The furnishing of a permanent and convenient supply of timber for local consumption, with such an additional supply to the sawmills for the general lumber markets as may be needed to justify efficient milling facilities and provide year-long operations.

The development and maintenance of a permanent pulp and paper manufacturing industry commensurate with the available water power and timber resources.

Timber-Use Policy

The productive forest land, after examination and careful study, will be divided into pulp-timber allotments, local-use allotments, and general-use areas.

1. *Pulp-timber allotments* will be laid out as complementary to definite available water-power sites suitable for use in the manufacture of pulp. Each allotment will include sufficient timberland to supply a sustained annual yield of timber equal to the mill capacity obtainable through a full economic development of the accompanying water-power site or sites.

2. *Local-use allotment* will be laid out on the basis of the suitability of the timber for the common local uses and its accessibility to points of consumption. In determining the size of local-use allotments consideration will be given to the probable opportunities for the local users to get material from present or future sales on pulpwood allotments, so that the allotments will not need in all cases to be so large as to supply the entire estimated future local demands. They will, however, be sufficiently large to permit of their being managed on the principle of sustained yield, using one or several allotments as the unit of management. On these allotments timber unsuitable for local use will be disposed of on the stump for pulpwood or other purposes under small, short-term sales.

3. *General-use areas* will include all bodies of timber not specifically placed in the two foregoing classifications. They will be available for sale for any product for the general or local market. Sustained-yield management will be practiced so far as possible.

Initial sales within an allotment will ordinarily include those timber units most accessible to tidewater, the more inaccessible units being left for later exploitation.

Other things being equal, preference will be given to such industries and applicants as contemplate the most complete manufacture in Alaska.

Every appropriate step will be taken to encourage the development of the pulp-timber and water-power resources of Alaska as economic conditions justify such development. Data on location and amount of timber supplies, power resources, plant sites, transportation, labor, markets, construction costs, operating costs, and other governing factors will be gathered and made available to possible timber buyers and other interested parties.

Sawmills established primarily to supply an important local demand which may be insufficient to provide year-long operations, permit efficient milling methods, and justify first-class equipment, will be encouraged in any efforts they may make toward the placing of the excess lumber cut on the general markets of the United States and foreign countries. The establishment of minor wood-using industries, especially those using western red cedar and Alaska cedar, will also be encouraged.

Sales of timber will not be made when it is anticipated that the wood will be exported from the Terri-

tory of Alaska in the form of logs, cordwood, or other raw product necessitating primary manufacture elsewhere. Export of raw material will, however, be allowed in individual cases where this will permit of a more complete utilization of material on areas being logged primarily for local manufacture; prevent serious deterioration of logs unsalable locally because of an unforeseen loss of markets; permit the salvage of timber damaged by wind, fire, insects, or disease; or bring into use a minor species of little importance to local industrial development. No sales, except for purely local use, will be made to aliens or alien corporations.

Small sales will be encouraged so far as is consistent with the investment required and the demands of the industries. Every encouragement will be given to the establishment of a competitive log market.

General Conditions Applying to Timber Disposal

The stumpage alone is offered for sale from the national forest, the land being retained by the United States for the production of succeeding forest crops. The timber is paid for in small installments as cutting proceeds and on the basis of a scale or measurement of the cut material made by a forest officer. The amount of each installment is approximately equal to the value of the stumpage that will be cut by the purchaser in a 2-month period of active logging.

Timber is ordinarily offered for sale on applications from interested parties, and in units of volume as desired, provided the requested unit is not unreasonably large as compared with the applicant's manufacturing or logging facilities. The sale contract covers all of the merchantable timber designated for cutting on a prescribed tract. Such a tract always consists of a complete logging unit; that is, a unit from which all of the merchantable timber should logically be taken in one logging operation.

The timber of the unit applied for is appraised by a forest officer and then advertised for sale by sealed bids for a period of not less than 30 days as required by law. The advertisement names the appraised stumpage rates as the minimum that will be considered. The timber is awarded to the highest bidder who can make a satisfactory showing of ability, financial and otherwise, to carry the proposed operations through to completion.

The stumpage prices now being received for national-forest timber in Alaska vary with the species, quality, and accessibility. Sitka spruce, western red cedar, and Alaska cedar for sawmill use usually sell for \$1.50 per 1,000 board feet. Hemlock for the same use averages \$1 per 1,000 board feet. Piling of any species varies in price from 1 cent to 1½ cents per linear foot accord-

ing to the length of the sticks. It is expected that any large units of pulp timber offered for sale in the near future will be advertised for disposal at not less than 60 cents per cord of 100 cubic feet for spruce and 40 cents for hemlock.

The bid stumpage rates in every long-term sale apply for a limited period only and are subject to readjustment at stated intervals throughout the life of the contract to bring them into conformity with the then current value of stumpage in southeastern Alaska.

The two large pioneer pulp-timber contracts that were awarded in 1927, and later canceled by mutual consent on account of the economic depression that developed, provided that the rates would not be subject to change until after the first 10 years of operation, but at the end of that period and at 5-year intervals thereafter they might be readjusted; also, definite figures were named as the maximum rates that might be established to apply during the two 5-year periods next following the initial 10-year period. At no time could readjusted rates, higher than those bid by the purchaser, be established which, so far as could be determined by the Forest Service, would result in making the cost of southeastern Alaska paper delivered at the large paper-consuming centers higher than the delivered cost of paper of the same kind produced by mills in other paper-making regions of the Pacific coast. In readjusting rates due recognition had to be given to the quality and accessibility of the timber included in the particular contract and to any other physical condition affecting the operations of the purchaser.

The maximum amount of timber that will be placed under contract to one firm and the period of time allowed for its removal from the sale area are governed by the purchaser's logging and manufacturing investment, practical operating methods, and markets. Five billion board feet of timber and a cutting period of 50 years were authorized for each of the two pioneer pulp contracts mentioned above.

Logging Methods and Costs

In the main, machine logging with donkey engines and wire rope is the most practical means of moving logs from the woods in this region because of the rough topography, the large quantity of debris on the ground, and the large size of many of the trees. Ground-skidding and high-lead systems are now used, but one of the overhead systems will probably prove most economical for extensive pulpwood operations. The methods of logging used in Alaska are also those used in Washington and Oregon, and the necessary machinery and supplies are manufactured in those States.

A large percentage of the timber can be logged directly into tidewater by the use of two and three

donkey engines working tandem. Log flumes, short railroads, or motortruck roads will be required to move the timber from the logging engines to tidewater in the longer valleys. Log driving is not practicable in the short turbulent streams.

Timber is towed to the mill in the form of flat rafts through the protected waterways. The cost of towing sawlogs is about 1 cent per 1,000 board feet per mile and the cost of pulpwood per cord should not exceed this figure.

Floating logging camps, which can be easily towed from one cutting area to another, are in general use. Similarly, donkey engines and all other logging equipment are moved on scows and floats.

The average cost of sawlogs, exclusive of stumpage, delivered at the sawmills in 1936 was about \$10 per 1,000 board feet. It is estimated that the total cost of unpeeled pulpwood logs delivered at local mills and including an average stumpage charge of 40 cents per cord will not exceed \$6 per cord (equivalent to \$10 per 1,000 board feet) during the next 10 years, on the basis of labor and equipment costs of 1936.

Existing Forest Industries— Present Situation and Outlook

The greater part of the timber used in southern Alaska is purchased from the national forests. The annual cut of the forest increased from 8,000,000 board feet in 1909 to 55,000,000 board feet in 1927, and was 43,000,000 board feet in 1936. The total for this 28-year period was 1,050,000,000 board feet. The greater part of the present output goes into lumber, but about 20 percent is used in the round for fish-trap and wharf piling or in the form of hewn ties for the railroads of the Territory. Juneau and Ketchikan have each a modern electric-driven sawmill of 100,000 board-feet capacity per 8-hour day. A second mill at Ketchikan can produce 25,000 board feet daily, and plants of equal size are located at Hyder and Hidden Falls. Numerous smaller mills cutting less than 10,000 board feet daily and operated intermittently are found in the smaller communities and in connection with mining and other industrial enterprises.

Most of the forest products manufactured are consumed locally by the fishing and mining industries. As the local lumber requirements are largely confined to the lower and middle grades, the two largest mills, which are in a position to cut and market their output by grade, are shipping a considerable and increasing amount of spruce uppers to the general markets of the United States and foreign countries. The shipment of lumber from the Territory originated during the World War, when much high-grade Alaska spruce was produced for airplane construction.

An extensive sawmill development primarily for entering the general markets is considered inadvisable. The pure stands of high-grade spruce saw timber are too limited to support a large industry, and it is unlikely that the mill-run of lumber from the predominating hemlock-spruce forests can compete with the material of the same species produced in southern British Columbia, Washington, and Oregon. The trees of the hemlock-spruce stands in Alaska are smaller and give less clear stock; the greater distance from market is a very important factor in handling a heavy low-grade product, and there are other drawbacks, such as lack of any local market for byproducts. The sawmill capacity in Alaska should be gaged to the local demand, and if this is done the supply of high-grade saw timber is sufficient to maintain a thriving lumber industry. The common lumber can be sold locally, and the clears produced from this select timber will stand the shipping charge to the general markets outside the Territory.

The hemlock piling industry offers no chance of expansion as the present operators are fully able to meet the local needs and piling cannot be shipped out of the Territory at a profit.

A market can undoubtedly be developed for Alaska cedar. The wood of this tree is somewhat similar to that of Port Orford cedar and is suitable for many of the products for which that valuable species is used. The manufacture of articles such as moth-repellent chests, and battery separators from Alaska cedar could probably be made an important minor industry here, or rough shakes for remanufacture and finishing elsewhere could be produced.

The manufacture of shingles is now confined to two small plants cutting solely for the local trade. In the future this should develop into an important industry, as the region has a large amount of western red cedar of shingle grade. The production of cedar telephone poles is also a possibility. Logging primarily for poles is practicable in some places, but as a general rule poles will be obtained in connection with logging operations for other products. Shingles and poles should be marketed to best advantage in the prairie Provinces of Canada and the Middle Western States, with shipment through Prince Rupert, British Columbia.

Possibilities for the Pulp and Paper Industry

The forest resources of southeastern Alaska will undoubtedly be used chiefly for the manufacture of newsprint paper because of unusually favorable conditions there for the large-scale operations that now characterize that industry.

Studies by the Forest Service indicate that the forests of this region, under a proper system of manage-

ment, can produce not less than 1,500,000 cords of pulpwood annually in perpetuity under proper forestry measures. Converted into newsprint this represents a production of 1,000,000 tons, or more than one-fourth of the present yearly consumption in the United States.

The policy of the Forest Service in limiting the development of pulp and other wood-using plants dependent on national forest timber to the total capacity that can be supplied indefinitely through tree growth insures permanent industries for this region. It prevents that overdevelopment and subsequent collapse through timber exhaustion that has characterized timber industries in many sections of the United States and is highly important to paper companies, with their heavy capital investments, that can be justified only by an assuredly long operating life.

Water-power resources for the manufacture of pulp and paper occur in the timbered regions. Over 600,000 horsepower in southeastern Alaska has been covered to date by reconnaissance or higher-type surveys and additional sites await examination. The sites are of small capacity, a feature that makes possible the development of power as an integral part of the pulp and paper projects and obviates dependence on large public-utility concerns for energy. The principal sites offer unusually low development costs.

The Federal Power Commission, under the Federal Water Power Act of June 10, 1920, has jurisdiction over the development and use of power sites in Alaska and the regional forester at Juneau acts as the Alaska representative of the Commission.

Power sites are developed and used under a form of license which calls for an annual rental fee and covers a period not in excess of 50 years.

The Federal Power Commission and the Forest Service coordinate their actions on applications for power and timber on pulp and paper projects in southeastern Alaska. The requirements for development and use of the two resources are fully harmonized.

Water transportation between Seattle and southern Alaska on a year-long basis is provided by two American companies operating combined passenger and freight vessels, as well as many strictly cargo carriers. Passenger vessels arrive at southeastern Alaska ports almost daily from June to September and at intervals of about 3 days during the remainder of the year.

All local industrial enterprises make use of motor-driven work boats in the network of protected sea channels which lie between this region and Puget Sound. Small tugs with barges and flat scows can transport coal over this route cheaply and safely.

The Orient and Australia are as readily accessible to Alaska as to the Pacific Coast States and British

Columbia. The Gulf States and other sections of the Atlantic seaboard can be reached by water shipments through the Panama Canal.

Approximate distances from Ketchikan, the most southerly Alaska port, to some important points are, as follows

	Miles
Minneapolis, via Prince Rupert, British Columbia, and Canadian National Railroad.....	2,390
Chicago, via Prince Rupert, British Columbia, and Canadian National Railroad.....	2,700
Seattle.....	660
San Francisco.....	1,300
Colon.....	4,638
New Orleans, via Panama Canal.....	6,084
Savannah, via Panama Canal.....	6,663
Honolulu.....	2,450
Yokohama.....	3,911
New Zealand.....	6,550
Sydney, Australia.....	6,850

Markets.—The United States has long been the world's greatest user of newsprint. The consumption is constantly growing, and for 1936 was 3,700,000 tons, or about 58 pounds per capita. To meet the increased demand and to offset production losses due to timber depletion around old plants, the industry has reached farther and farther afield from the great consuming center represented by the eastern United States. The virgin forests capable of supplying the spruce, hemlock, and true firs, so important for the mechanical and sulphite pulp used in newsprint have long since been followed across the border into eastern Canada, and this migration has now reached the stage where the greater part of the newsprint requirements of the United States are supplied by Canadian mills. The United States has imposed no tariff on foreign newsprint since 1913.

The expansion of the industry into Canada, the region next in accessibility to the large markets, though on foreign soil, was a logical development. But the projects of outstanding merit in eastern Canada have now largely been taken up. Those remaining apparently possess no advantages for supplying paper to the eastern markets that cannot be offset to large extent by other advantages enjoyed by plants that might operate in Alaska and ship on a relatively cheap per ton-mile rate through the Panama Canal.

General Discussion.—The extensive forests of pulpwood of southeastern Alaska are owned by the Federal Government and managed for a sustained production of timber; excellent water-power resources for industrial use are available; tidewater transportation both from the woods to the mills and from the mills to markets can be used; and an equable climate permits plant operation and unhindered shipping throughout the year. With these advantages this section of the Terri-

tory should be able to develop into a great permanent paper-making region, with model industrial towns, thoroughly equipped, efficient plants, and a population of skilled workers with a tradition for woods work and paper making.

The substantial contribution the newsprint industry can make toward regional development is indicated by the following: Two workers are required in woods and mill for each ton of daily paper output and the possible sustained daily production of southeastern Alaska is 3,200 tons. The figure 4 is conservative as representing the worker and all dependents in the community, including workers in service industries. A total of 25,600 persons would thus be supported by a full development of the newsprint possibilities, and this should result in an increase of approximately 100 percent in the population of this section of the Territory.

Alaska does not yet have any pulp and paper mills. British Columbia, with timber and physical conditions which quite closely resemble those of southeastern Alaska, has two newsprint mills and a number of pulp mills. The more northerly of these newsprint plants is located at Ocean Falls, British Columbia, 296 miles south of Ketchikan, Alaska. The establishment of newsprint plants in Alaska calls for merely an extension of the industry to a more distant section of an existing operating field represented by Oregon, Washington, British Columbia, and southeastern Alaska. It does not involve adaptation to an entirely new set of conditions or the surmounting of difficulties not already known to west coast operators.

The Government policy in effect for the handling of the Alaskan national forests makes it possible to get a long-term supply of timber definitely tied to the mill. The modern newsprint plant represents an investment of from \$15,000,000 to \$25,000,000, and this investment can only be justified through control of the raw material necessary for a long-operating life. The practice of forestry by the Federal Government on the timberlands of the region with a view to producing a sustained yearly supply of pulpwood for the mills to be established there gives added assurance of the availability of a future supply of raw material. The fact that payment for the timber placed under contract need be made only as cutting proceeds eliminates the necessity for the extremely heavy, initial investment in standing timber that would be required of the manufacturer at the time the plant is established if the timber supply of the region were privately owned, or if the Government sold the timber outright at the start of operations. The method to be followed in disposing of publicly owned timber, as outlined above, is substantially the same as that followed by the timbered

Provinces of Canada, where there has been a very great expansion of the newsprint industry in recent years.

Extensive field work and careful investigation of all features related to this industry have been carried on by various branches of the Federal Government; e. g., the Forest Service has cruised and mapped over 900,000 acres of pulp timber to show the amount and quality of the pulpwood available. The Forest Service has logically taken the lead in this work, but has been materially assisted by: (1) The Federal Power Commission, in study of water-power resources; (2) Geological Survey, on a determination of the streamflow on power sites and preparation of topographic maps of power sites and timber areas; (3) Coast and Geodetic Survey, on hydrographic surveys of certain sea channels; (4) the Navy Department, on an aerial survey of timber and power resources of the region; (5) Division of Surveys of the General Land Office in extending rectangular land surveys over large timber areas.

The Forest Service, at the request of three interested parties and after extended preliminary negotiations, advertised two Alaska pulp-timber units for sale in 1927, each unit aggregating 5 billion board feet, or 834,000 cords. Each unit has sufficient timber to supply the needs of a paper mill of 500 tons daily capacity for 50 years. One of these units is located in the vicinity of Juneau and the other near Ketchikan.

Only one bid was received on the Juneau unit. The bid rates were the same as the upset figures named in the advertisement. The bid was submitted by George T. Cameron, publisher of the San Francisco Chronicle, and was made on behalf of himself and of Harry Chandler, publisher of the Los Angeles Times. It was understood these two publishers proposed to establish a mill chiefly to supply their own newsprint requirements.

Two bids were received on the Ketchikan unit, both of them naming rates higher than the upset figures given in the advertisement. The higher bid was made by I. and J. D. Zellerbach, of the Crown Zellerbach Paper Corporation of San Francisco. The other bid was submitted by the International Paper Co. of New York.

In accordance with the procedure that has been put into effect, conditional awards of the timber were made to the two successful bidders, and the Federal Power Commission granted them preliminary power permits on the power sites needed for the operation of the proposed mills. The parties were given 3 years to cruise and map the timber areas which are to go into the 50-year sales and to do the necessary engineering work on the power sites. In both cases time extensions on the conditional awards were granted, due to the economic depression that had developed, but it finally be-

came evident that the projects could not be installed under the then economic conditions, and they were canceled in the spring of 1933.

National Forest Administration

The national forests of Alaska represent withdrawals from the open public domain by Executive Orders largely between 1902 and 1907. They were established primarily to insure the orderly use and perpetuation of their vast timber resources, but the other available resources, such as water, forage, and recreational opportunities, as well as timber, are administered by the Forest Service. Forest Service jurisdiction dates from 1905.

The national forests of Alaska are administered by a branch of the Forest Service, Department of Agriculture, resident in Alaska. The chief administrative officer is the regional forester, with headquarters at Juneau. The two national forests are split into a total of five administrative divisions, with headquarters in Ketchikan, Petersburg, Juneau, Cordova, and Seward, the community centers from which the several divisions can be most easily covered in field work. Each division has a district ranger and a small staff of subordinate officers. The regional forester has a staff of assistants for handling specialized and technical lines of work and for guiding the work of the divisional forces.

Responsibility is placed as far down the organization line as practicable. Action on a majority of the field problems can be taken in the divisions without prior reference to the regional forester. Only matters involving important questions of general Forest Service policy need be referred to Washington. Well over 90 percent of all problems are decided in Alaska.

Problems and Recommendations

Investigational

PROJECT 1. ALASKA FOREST AND RANGE EXPERIMENT STATION

Conservative estimates show that Alaska, with a gross area of 590,884 square miles, has perhaps 400,000 square miles, or 256,000,000 acres, in forests, grass, and tundra vegetation of present and prospective economic importance. The south coast has 4,000,000 acres of spruce and hemlock forest capable, under proper forestry treatment, of supplying the nation with 1,000,000 tons of newsprint per year in perpetuity, but still awaiting development. The vast interior region contains not less than 40,000,000 acres of fairly dense forest of small trees that can contribute materially to the homemaking needs of a large future local population. Open woodland and grasslands aggregating at least 110,000,000 acres are available throughout the Territory to support unequalled herds of big game animals for the enjoyment of the Nation's sportsmen, as

well as to maintain domestic livestock enterprises; 100,000,000 acres of tundra vegetation in the extreme north and northwest can provide the basis for an expanded and stabilized reindeer industry that will improve the lot of the local Eskimo population.

The social and economic welfare of the Territory is in large measure bound up with the manner in which this vast empire of timber and range land is to be used and the extent to which it is to be protected from fire.

The development of the vegetative resources of Alaska has barely started, and at present the Territory is in about the same stage as were the Western States 70 years ago. The Federal Government is now preparing to spend huge sums to correct some serious mistakes that were made in the handling of the western resources and with this as an object lesson similar mistakes in Alaska should be avoided. This can best be done by planning for a proper use of the resources. Such planning work requires scientific knowledge that will indicate how the forests, grasslands, and tundra can be administered to provide the maximum output and at the same time avoid deterioration or depletion. The problems involved are intricate, cover a vast field, and can be studied satisfactorily only by the Federal Government. In this connection it must be pointed out that these lands are now almost wholly in Federal ownership and private use of them can be made subject to such restrictions as Congress and the responsible Federal agencies may prescribe. There is, therefore, an opportunity and a responsibility for the Federal Government to promote development and use along proper lines.

Planned programs of study should be started to determine the basic information needed: (1) For growing of timber as a crop, such as rate of growth on sites of various types, how to favor the desirable species in the new crop, insect and disease control, best methods of harvesting, methods to insure reproduction under varying conditions, and market possibilities; (2) for maintaining and improving the character and volume of forage crops on the range lands and increasing the numbers of the more desirable game animals; (3) for controlling the very destructive forest, grass, and timber fires that now occur in interior and northern Alaska.

To further this investigative program Alaska should have a forest and range experiment station. This need has been seen for some time and a specific authorization for the establishment of a station of this kind in Alaska was contained in the Forest Research Act of May 22, 1928 (45 Stat. 699; Sec. 581a, Title 16, U. S. Code), commonly known as the McNary-McSweeney law. This act provided for a comprehensive covering of the United States with such stations to cope with the vary-

ing problems encountered, and 12 stations, each in a region of distinctive vegetation, have now been established under the Department of Agriculture. Work on the Alaska problems should not be longer delayed.

PROJECT 2. AERIAL PHOTOGRAPHIC SURVEYS

Practically all development activities in Alaska, whether public, corporate, or individual, require good maps, but great blocks of the Territory have not yet been properly covered. Aerial mapping has proved to be the cheapest and quickest method of acquiring survey data.

The Navy Department in 1926 and 1929 covered 19,000 square miles of national forest land with aerial surveys and the maps have been of inestimable value to the study of the timber, water power, mineral, and other resources. The national forest area should be completed as soon as possible. The work would entail the photographing of 9,200 square miles on the Tongass Forest and 7,500 square miles on the Chugach. An additional 6,800 square miles comprising the open public domain of the Kenai Peninsula should be covered along with the Chugach Forest area of the peninsula. Total area to be surveyed is 23,500 square miles.

The project will include aerial surveys, printing and mounting of photographs, and compilation of maps.

PROJECT 3. WOOD-USING INDUSTRIES—SURVEY OF POSSIBILITIES FOR

The national forests of Alaska contain 85 billion board feet of timber. The principal species are western hemlock and Sitka spruce, 79 billion feet. Western red cedar, Alaska cedar, cottonwood, alder, white spruce, and Alaska white birch comprise the remainder.

The two leading species are now cut moderately for lumber and will some time be used extensively for pulp and paper. These, as well as the minor species, are, however, suitable for a great variety of minor and specialized products now widely used in the United States. Examples are barrel staves, small dimension stock for furniture, turning blocks, battery separators, Venetian blinds, oars, brush handles, and toys. These minor products are usually manufactured in small plants and require only simple technical and business supervision. They thus offer a means to obtain an early and substantial increase in the use of the forest resource pending the establishment of the pulp and paper industry. Certain miscellaneous woodland resources, such as moss, peat, and berries, also offer commercial possibilities.

A survey should be made of the minor forest products industries to determine for the various local woods and miscellaneous woodland resources, possible uses, available markets, manufacturing methods and costs, selling prices, and best local sources of raw mate-

rial. The information thus obtained should be used to promote the establishment of such industrial enterprises.

PROJECT 4. PULP TIMBER SURVEYS

A carefully planned development of a pulp and paper industry in Alaska commensurate with the growth possibilities of the forest area and the available water power necessitates a careful study of the timber resources. Detailed surveys are needed of the type, condition, and volume of timber and of the topography on each area which is to form the unit in timber management and in logging operations. Satisfactory preliminary surveys were made on 900,000 acres of pulp timber over a series of years ending in 1933, when this work was practically terminated for lack of funds. These preliminary surveys should be resumed and detailed surveys on the best areas should be initiated and carried forward on a substantial scale. The work will promote the establishment of the pulp and paper industry.

PROJECT 5. STUDY OF PROSPECTS FOR PULP AND PAPER INDUSTRY

The establishment of this industry is thought to offer better prospects for a substantial thrust ahead in Alaska development in the near future than any other class of enterprise. Its importance from a development standpoint can be appreciated when it is considered that the possible permanent production of the Tongass Forest of 1,000,000 tons of newsprint annually would require at least six large plants, each of which would entail an investment of not less than \$10,000,000, furnish employment in woods and mills to 1,000 workers, and add material support to much-needed betterment in the transportation facilities for cargo and passengers available to the Territory.

Judging from the interest shown in Alaska pulp and paper projects before the start of the economic depression in 1929 and in view of the present all-time high rate of production and consumption of newsprint, it is reasonable to suppose that consideration of the Alaskan possibilities could be revived at this time.

Recommendation is made that a study be made by a competent specialist of the technical and economic problems involved in the extension of the pulp and paper industry to Alaska, including a study of the conditions under which water power and timber in Alaska are made available to prospective operators and of the extent and location of possible markets.

Administrative

PROJECT 6. FIRE PROTECTION ON THE OPEN PUBLIC DOMAIN

The establishment of a fire-protection organization on the open public domain is an essential first step in any attempt to bring the public-land resources under

a reasonable degree of control. The organization should be represented in each of the larger community centers throughout the regions of high fire risk, but the initial forces of each headquarters might well be limited to the key men around whom a larger field force may later be built, and one or two assistants. Most of these men should be year-long employees. The key men should be of proven ability in establishing fire-protection systems, including ability to promote favorable public sentiment, and effect cooperative agreements with public and private agencies for the prevention and suppression of fires.

Educational efforts directed toward fire prevention would constitute one of the major functions of the organization and be especially important during the first few years. With a population in the fire-susceptible regions of not to exceed 32,000, or the equivalent of one person to 16 square miles, an opportunity exists for highly effective educational work through frequent personal contact. Close association should be maintained with miners, mining companies, transportation agencies such as air transport, river steamer, and stage lines, sportsmen's organizations, and, in fact, all classes of workers and agencies having activities in the open country.

Cooperation in the prevention, reporting, and suppression of fires should be arranged among the many Federal and Territorial agencies having widespread representation throughout the country, such as the Alaska Road Commission, Alaska Game Commission, Alaska Railroad, and Office of Indian Affairs. The cooperating public agencies will, as a whole, be able to carry a large part of the burden of fire-protection work if given competent direction and some financial assistance by the fire organization.

During the initial stages of the fire-protection administration the keymen should make a detailed study of the fire conditions of their respective districts. The fire organization should not be materially expanded or incur the expenditure of large sums for detection and suppression equipment until these studies and the experience of the keymen have indicated the size and character of the fire problem and how it can best be met.

PROJECT 7.—AIRPLANE

To expedite the present and continuing program of surveys and studies of the timber, water power, agricultural, mineral, and other resources of the national forest; to assist in the selection of routes for roads, truck trails, prospectors' trails and transmission lines needed for resource development; and to permit of quicker and more frequent service to users of the national forests, an airplane should be acquired for the use of the Forest Service in Alaska.

The Forest Service has extensive contacts and business dealings with individuals and corporations throughout the southern coastal strip, the most populous section of the Territory. This national forest region, which is 1,200 miles in length and contains 12,000 miles of shoreline, is served by 9 Forest Service launches with a speed of 8 to 10 miles per hour. The widespread commercial use of airplanes there has rendered Government launch travel obsolete as a means of providing service to those making use of national forest resources.

The airplane is the most satisfactory and cheapest form of transportation in Alaska, and should form an integral part of the Forest Service transportation system. The first plane to be purchased should be stationed at Juneau, where it is most needed for Forest Service work and where it would be available for use by other local agencies of the Federal Government. It is estimated that the Forest Service would use this plane a total of 300 hours flying time per year, and that not less than 300 hours of service could be allowed other Federal agencies.

A Forest Service airplane stationed at Juneau would permit of retiring at least two launches and crews now engaged in ranger work. A preliminary study indicates that the saving in this one line of administrative field work alone would justify the purchase and operation of an airplane.

PROJECT 8.—WOOD PRESERVATIVE TREATING PLANT

Large quantities of sawed material and piling are used in Alaska each year by such Government agencies as the Lighthouse Service, Office of Indian Affairs, Forest Service, Bureau of Public Roads, and the Alaska Road Commission.

Wood exposed to the weather, if unpainted or untreated, has a very short life in the wet climate of southeastern Alaska. Teredos and sand fleas destroy untreated wharf piling in periods as short as 3 years.

Pressure-treated timber or lumber needed in Alaska must now be brought in from the Pacific Northwest and is very costly. Since Alaska woods are suitable for practically all the structural timber needs of the Territory, the installation of a Federal plant to treat local wood materials for use by public construction agencies would be advantageous. It doubtless would result in a saving of funds to the agencies concerned, and at the same time further the use of Alaska forest resources. Arrangements should be made to have this plant treat material for the municipalities of southeastern Alaska, which use large quantities of decking, piling, and structural timbers each year in street and wharf improvements. If an Alaska treating plant were available many Federal, Territorial, and municipal agencies that now use untreated material would be able to take ad-

vantage of the savings and other conveniences that accrue from the use of treated material.

The proposed plant should be located at Ketchikan, which is the most important logging and sawmilling center in Alaska, makes use of much wood in local Federal projects, and has ocean freight service to more Alaska towns than any other Alaska port. A plant to handle dock piling and structural timber should have a treating cylinder about 16 feet in diameter and 82 to 86 feet long. It is recommended that funds be made available for this plant.

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Significance of Water Supplies

Supplies of water are universally regarded as indispensably related to the welfare of mankind and the growth or utilization of the resources on which depends; often carrying calamity when occurring in excess amounts, as during floods, or causing untold suffering when deficient, as in deserts, or powerfully helpful when controlled to supply man's many needs. Knowledge as to maximum, minimum, and average amounts of available water and its physical characteristics enters therefore into every problem of man's utilization of nature, whether it is to be undertaken by the Nation, small political units, industrial enterprises, or the individual. True, in the initial stages of development the readily available local supplies are often adequate to meet those demands, but such a condition passes as the pioneer stages of settlement and development are replaced by larger settled communities or by heavier drafts for power or other industrial uses, so that larger supplies must constantly be sought and made available, often at fabulous expense.

Such has been the record of history since the dawn of civilization, and one would find slight basis for predicting that this would not continue to be true for such future time as can be forecast. It is therefore among the first duties of statesmenlike legislators, wise executives, keen business men, and enlightened citizenry to take steps so that the facts regarding the available and potential supplies of water will be determined, as in that way these supplies may be sanely used to the best benefit of all, and thus safeguarded and put to their highest use.

At this time Alaska has in few places felt keenly the pressure to utilize to the utmost its natural supplies of water. Even now, however, many of the miners have had to limit the scale of their operations by the available water supply, and already ditches, some of which are scores of miles in length, have been built or extensive pumping plants installed to bring the desired supplies to the place where mining is in progress. Such demands for water may confidently be expected to increase many fold as the mineral resources of the Ter-

ritory are developed. Practically each step of the mining industry calls for utilization of water, whether it be under considerable head, as in hydraulicking, or for washing and separating minerals, as is necessary in the milling of gold and copper ores.

The enormous extent of Alaska makes the water problems in one part vastly different from those that obtain in other parts. A precipitation of nearly 200 inches a year in portions of southeastern Alaska is in vivid contrast with that where the precipitation is 15 inches or less, as prevails throughout most of the interior region. The run-off in the steep rocky areas of the mountains is far different from that in the lowland areas of central Alaska, where permanently frozen subsoil to a depth of more than 300 feet prevents normal temperate-country storage of ground water. Consideration of the proper allocation between different uses of the same water for domestic or municipal supplies, industrial use, power developments, and the preservation of wildlife, calls for thorough knowledge of the facts and discriminating judgment in adjusting to meet them.

Some of the specific problems relating to the use of water in some of the industries in Alaska are discussed in other staff reports. Thus the use in mining is noted in the staff report on Mineral Resources, for the development of forest products in that on Forest Resources, and for agricultural purposes in that on Agriculture. These uses, therefore, may be dismissed from detailed consideration here. Other uses will be discussed more fully in later sections of this report. Among the uses that might at first be overlooked are those in connection with the protection and preservation of the wildlife and recreational resources of the country.

The wildlife resources of Alaska are important from an economic as well as recreational point of view. The furs produced in the Territory alone have an annual value of \$2,250,000 and form the greater portion of the cash earnings of the natives. Fur production is third in rating of all commodities in Alaska as to total value. The natives depend to a large extent upon wildlife for food and clothing. Alaska is the last pioneer country under the jurisdiction of the United States, and because of this fact its wildlife has an important value from a recreational point of view. Considerable revenue is acquired in the Territory, because of its wildlife, from visiting photographers and hunters who must employ guides, packers, and other camp

¹Prepared by a group composed of Dr. Phillip Smith, Geological Survey; Roger B. McWhorter and Thomas Tate, Federal Power Commission; T. W. Norcross, Forest Service; Lt. Col. L. E. Atkins and Capt. P. H. Timothy, Corps of Engineers; W. C. Crouch, Bureau of Biological Survey. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above named group.

help as well as be furnished with transportation during their sojourn in the Territory.

Since wildlife is an important resource in Alaska and the Territory is a pioneer country, nothing should be done in the development of water resources that would be seriously detrimental to wildlife. We should profit by the sad experiences in the States and not drain nor flood areas when in so doing the wildlife in these areas would be depleted and the extent of benefits to other resources is doubtful. In all proposed water resources developments the wildlife should be given proper consideration.

Government Authority and Obligations for Water Investigations

Authority to conduct investigations related to water and its utilization already exists for several of the Federal organizations, and some work has been done under those authorizations. However, there has been no adequate financial support for most of that work, and apparently more pressing need for other purposes of the funds that might be available has resulted in actual suspension or drastic curtailment of these activities for many years. For instance, the Geological Survey, in 1906, under its general authority for mineral investigations, started to make measurements of some of the streams in different parts of the Territory, especially as to their availability and sufficiency for supplying mining needs, but that work was discontinued after a few years because of lack of funds.

The undertaking of general fundamental water-resources studies should not be left to the hazard of individual initiative or private support, because the main value of these studies lies in the continuity, completeness, and availability of records procured under recognized standards. They should therefore be made under national auspices, with such local and Territorial assistance as may prove advantageous, by men trained and skilled in the conduct and interpretation of such investigational work. In this way, and in this way only, will needless duplication be avoided and the records have the necessary continuity, be made on recognized standards, not serving special interests, and be made uniformly available to all classes of citizens who need the information they supply. These fundamental studies would not preclude or meet the necessity for individual investigations of primarily individual problems, which obviously should be conducted by private means and at private expense.

While stressing the fact that these fundamental water-resources investigations require continuity of action, it is obvious that Alaska has not yet reached a stage of development which would justify more than a modest start on a program which would be warranted in a more

highly developed country. For this reason any program adopted now should recognize that fact and yet be planned so that it may advantageously fit into a more expanded program that later may prove desirable. For this reason it is essential that the work should be so organized that it serves the present needs and yet could be modified and altered to meet prospective demands as they arise or decline.

Summary of Past and Present Investigations

To review briefly what has been done or is in progress to meet the needs for information on water supplies, there are four main lines of work that will be mentioned here, though necessarily there are many subsidiary lines that have been contributory to these studies and, like topographic mapping, are indispensable for the proper accomplishment of those studies. The four major lines are measurements of surface-water supplies, studies of water-power potentialities, studies of underground sources of supplies, and prevention of damage by water. No sharp line of demarcation exists between some of these, as, for instance, the measurement of surface supplies is an indispensable part of studies of possible power sites; ground water reaching the surface in the form of hot or mineral springs may be a significant factor in the flow of certain surface measurements; and prevention of stream damage may call for measurements of the quantity of water, its head, and mineral content.

The measurement of surface water supplies of Alaska was started by the Geological Survey in 1906 to afford necessary information of significance to the mining industry. The work was continued for several years by Survey hydraulic engineers, at first solely at Survey expense and later through cooperation with the Forest Service, during which time many streams in Seward Peninsula, the Yukon-Tanana region, and the south-central part of Alaska were measured and the results published. (A list of these publications, as well as references to other reports bearing on water resources developments, is given as an appendix, under the heading "Bibliography.") In 1921 inadequate funds for the Survey's other Alaska studies necessitated its discontinuing further participation in stream measurements. Special studies needed in its own work and later as the designated agent of the Federal Power Commission resulted in the Forest Service undertaking the measurement of some of the significant water supplies in southeastern Alaska and continuing that work to date. In this connection it may be mentioned that one of the requirements for the granting of permits or leases by the Federal Power Commission is that suitable records of stream flow shall be supplied by the applicant at private expense. The records of some of

these measurements were published by the Federal Power Commission in a report by Dort² in 1924, but no systematic regular publications have been undertaken. In 1930 F. F. Henshaw, senior engineer of the Federal Power Commission, in cooperation with the Geological Survey and Forest Service, summarized all the available records for southeastern Alaska stream measurements for the period 1909–30.³ The records obtained by the Forest Service have necessarily been limited almost exclusively within the area of the national forest in southeastern Alaska, and those required by the Federal Power Commission. Some private measurements of water supplies have been made, especially in the development of mining properties, but these are almost universally held by their makers as confidential and usually relate only to minor individual supplies.

Water-Power Resources of Alaska.

Under Part I of the Federal Power Act, the Federal Power Commission has the same jurisdiction to issue licenses for water-power projects in the Territory of Alaska as in the several States, i. e., in every case where the project affects public lands or reservations of the United States, or where it is located upon navigable waters of the United States, or other streams subject to the jurisdiction of the Congress. It, therefore, exercises supervision over the development and use of power sites in the National Forests and the public domain of Alaska. The Regional Forester at Juneau acts as the Alaska representative of the Commission.

The Federal water-power act provides for the development and use of power sites under a form of license calling for a nominal annual rental fee per horsepower developed and covering periods not exceeding 50 years. Licenses are renewable under certain conditions at the end of the period for which granted. After bona fide construction has begun, a license can be revoked only by a decree of a Federal court.

Owing to the close relationship in paper-making projects between water-power development and the use of timber resources, the Federal Power Commission and the Forest Service coordinate their actions on applications for power and timber on pulp projects in southeastern Alaska. Power sites and the appurtenant timber supply are awarded to single concerns, and the requirements for development and use are harmonized.

Already about 50 projects involving approximately 32,000 horsepower and ranging in size from 10 horsepower to 5,000 horsepower are now under Federal permit or license.

Studies of potential water-power sites have been limited almost exclusively to areas in southeastern Alaska. In other parts of Alaska the power resources have received almost no attention by Government agencies, though a start on that work was made in 1913 in the south-central section. This work was discontinued after about 5 months in the field.

Such investigations as have been made indicate that at least several hundred thousand horsepower that can be developed cheaply are available in southeastern Alaska. Preliminary surveys have been made of projects comprising over 350,000 horsepower, and reconnaissance of additional projects indicate that the total capacity of sites capable of affording cheap power may exceed 600,000 horsepower, with possible additional important sites yet to be discovered. However, in the absence of adequate topographic maps, more complete stream measurements, and more specific examination, the capacity of many of the sites is largely conjectural.

The individual capacities will undoubtedly be small, the largest single site so far investigated having a firm capacity of 32,000 horsepower, but in many places power from several sites can be concentrated economically at a single manufacturing center. For example, 50,000 horsepower can be developed in one powerhouse from two sites adjacent to the head of Speel River Arm of Port Snettisham, near Juneau, and the development of two other sites in the same locality would increase the concentration at this point to a total of 75,000 horsepower. Three sites adjacent to the head of Bradfield Canal near the town of Wrangell have a combined capacity of 54,000 horsepower. A concentration of 60,000 horsepower can easily be effected at Ketchikan.

In respect to water-power development, the outstanding characteristics of the region are: small drainage basins which yield heavy run-off, good storage facilities, high heads, short conduit lines, accessibility of the projects to navigable waters, and opportunity to locate industrial plants at the powerhouse sites or within reach of short transmission lines. Run-off characteristics are such that annual storage capacity is required, but there are many natural lakes throughout the region which can be enlarged for this purpose.

The individual known power sites are relatively small in capacity; Alaska has no large centers of population, and great distances preclude the transmission of power to populous centers of the United States. For these reasons, the water-power resources of Alaska do not favor the development of large utility systems. The chief value of these power sites in Alaska is largely local, in connection with local industrial enterprises.

Industrial development in southeastern Alaska is to a large extent dependent on the availability of low-

² Dort, J. C., *Water Powers of Southeastern Alaska*, 1924.

³ Henshaw, F. F., *Surface Water Supply of Southeastern Alaska, 1909–30*. U. S. Geol. Survey Bull. 836, pp. 137–218. 1933.

cost power. Among the industries which might operate extensively in this area are mining, pulp and paper manufacture, electro-chemical processes, and the utilization of fish products. Mining is already important and is the largest present user of water power. The increasing interest now being shown in mining enterprises presages rapid expansion in this field in the near future.

An outstanding use of power eventually will be for the manufacture of newsprint paper. The Territory grows timber species which are highly valuable for paper manufacture and can maintain a sustained yield sufficient to produce 1,000,000 tons of newsprint paper per year. Power needs for this industry alone would be approximately 250,000 firm horsepower which can be developed at sites favorably located and at relatively low cost. The combination of cheap and abundant water power and extensive supplies of readily available and suitable pulp wood will prove of inestimable value to the industrial growth and prosperity of this section of Alaska.

Other Uses for Water

With increased industrial development will come the problems of domestic water supply and sanitation for increased population in more or less concentrated areas. Owing to the rugged topography of the coastal section, sites for industrial and urban development are largely confined to the shores of tidal water. The potential sources of surface water for domestic and industrial consumption are in steep drainage basins which rise rapidly from the shore to relatively high elevations. Annual precipitation and run-off are relatively high, but most of the drainage basins are so small that there is little opportunity for multiple use of the available water. It will therefore probably be necessary to reserve certain watersheds solely for domestic and municipal use.

Ground Water Investigations

Practically no studies of ground water or the quality of water have been made by Federal agencies in Alaska. An examination of the mineral springs of Alaska was made in 1915 and 109 springs listed and some data given regarding them. This tabulation showed that the springs are widespread throughout the Territory and include such diverse types as 75 hot or warm springs, 17 cool carbonated or "soda" springs, 13 cool sulphur springs, 3 iron springs, and 1 salt spring. Obviously, in the short time given to the work, only a few of the more accessible and better-known springs were examined at all and none of them intensively.

Flood-Control Projects

Investigations of flood control and prevention of damage by streams have been well handled in the past,

principally by the Corps of Engineers of the United States Army. Individual projects of this sort are brought to the attention of that organization, and a well-planned method of procedure has been outlined for investigation and report and ultimate specific authorization and appropriation for such as are approved. Records of the investigations, recommendations, and actions in the matters are published as congressional documents. Among projects of this sort in Alaska that have already reached advanced stages are the control of Lowell Creek in the vicinity of Seward and of Salmon River near the town of Hyder. Streams on which preliminary investigations have been authorized are Tanana River and Chena Slough, Lowell Creek, and Skagway River.

Recommendations

1. Aerial photographs of suitable scale and accuracy should be made for the entire Territory for mapping and other technical purposes. For individual areas, large or small, the aerial photography should be followed by the making of planimetric maps and later by topographic maps. In the making of each, priority should be given to the areas where the need is the most urgent for use in determining the location, size, and value of natural resources and in deciding on the method of developing and utilizing of such resources.

2. A program of stream measurements should be undertaken at once to provide basic information as to supplies of surface water now available for mining, industrial, and power purposes in the more developed areas of the Territory. As a start, this would require the establishment of three or more local offices, each directed by an hydraulic engineer skilled in water measurements and in their interpretation, each office to have one or more technical assistants, together with the necessary field helpers and clerical service, and to be provided with funds for travel, construction, and maintenance of river-measurement stations, and other equipment and miscellaneous expenses.

3. Adequate examinations of the potential sites of water-power developments should be made throughout the Territory. This would contemplate fairly detailed examination of the sites close to the more settled areas or to the places where industrial utilization of timber, pulp, minerals, and other natural products is most likely to call for the development of power. Examinations in the more remote areas and those less likely to be developed soon should be made in only enough detail to determine the broad general features.

Such studies would require three or more engineers specially qualified in the broad aspects of the problem, with such assistants as would be needed to carry on detailed examinations in the areas selected. Obviously,

the start and the more intensive work done under such a program would concern studies of sites in the neighborhood of the mining and other industrial areas and the more fully developed communities. The work started in southeastern Alaska should be continued until completed.

4. A general program should be formulated for the study of the special factors affecting water supplies in such regions as Alaska. As yet many of these factors are undetermined or indefinite, so that it is not now possible to state in definite terms the specific problems meriting first attention. Among those that warrant consideration are the winter conditions of streams of various volumes, the conditions by which the streams are closed or freed of ice in the fall and spring, the method and amount of underground-water movement and storage in areas of permanently frozen ground, the mineral content of some of the larger water supplies as affecting the use of those waters for steam and other industrial uses, the regimen of streams deriving their supplies of water mainly from glaciers, the disposal of detrital waste from mining processes by utilization of water, the searching out of additional hot or mineral springs that might be utilized to the profit or benefit of the community. Such studies would require the constant attention and investigation of one or more qualified hydraulic engineers, with suitable assistants and helpers, and funds for the laboratory equipment needed and for the required field studies.

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AGRICULTURE¹

Foreword

The survey on which this report is based indicates that agriculture in Alaska should be closely coordinated with and made supplemental to local industrial development.

Long distance from external sources of food supply and existence of suitable physical conditions make possible the profitable production of agricultural crops for local use. Advantage should be taken in the interests of an improved local economy of the opportunity thus presented. On the other hand, the long haul to outside markets and overproduction in continental United States of the classes of field products that can be successfully grown in Alaska lead to the conclusion that no substantial invasion of those markets by Alaska farmers would be possible until there is a decided change from present conditions.

Alaska agriculture offers fair possibilities at the present time for expansion in contributing to the needs of those locally engaged in other occupations. Doubtless these possibilities will improve as the natural resource industries increase in size and number. Immense quantities of foodstuffs that could be produced locally are now sent into the Alaska Railroad belt and other sections of the Territory, which are very distant from the Puget Sound supply points. Such shipments necessarily carry a heavy transportation charge—one that places the local producer in a good competitive position. The price advantage in favor of local products will doubtless always exist in some degree over the entire Territory except the more accessible southeastern Alaska region. Additionally, certain products such as garden vegetables, eggs, and dairy items carry a higher than average transportation cost. Locally grown offerings are always preferred because of their freshness and therefore command a premium price in the markets.

Alaska agricultural production, in view of these facts, now tends and doubtless will continue to tend toward specialization in the somewhat perishable and consequently high-priced commodities. The same facts would indicate that the localities in which a profitable agriculture may be developed are those in close proximity to those present or future community

centers that spring from and are chiefly supported by industrial enterprises.

If, as expected, market gardening and poultry raising gain an important place in the upbuilding of widely scattered communities throughout the Territory, small farm units are almost certain to be the rule. Many such small scale operations will afford a livelihood for a considerably larger number of persons than the same acreage in large mechanized farms and should be a big factor in the local economy.

Substantial Federal aid and encouragement to agriculture of the usual types granted in the States should continue to be applied in Alaska. No emergency condition exists that demands drastic action and there appears to be no necessity or desirability for applying any "forced-feeding" process to induce agricultural development. Investigation of agricultural possibilities in the several natural regions and localities, continued experimentation looking toward crop improvement and greater variety of natural and processed products, and widespread agricultural extension work should, with free land and a local market protected by isolation, lead to sound agricultural development.

This report deals primarily with the two agricultural regions—the Matanuska and Tanana Valleys. Both of these areas have been subjected to study over a period of years, have a considerable agricultural development at this time, and are traversed by the Alaska Railroad.

Although there is good agricultural land in the Kenai Peninsula, its agricultural development should not be stressed at this time. Adequate transportation facilities to this region are lacking, and until truck roads are provided to connect with the Alaska Railroad the region will remain quite inaccessible.

Experimental Stations

Agricultural Experimental Stations

The establishment of agricultural experiment stations was authorized by Congress in 1899, following a field survey extending over the years 1897 and 1898.

SITKA STATION

Surveys were started at Sitka in southeastern Alaska in 1898 under direction of Dr. C. C. Georgeson, who remained in charge of the subsequent experimental work here and elsewhere in Alaska until his retirement in 1927. The Sitka work was confined to fruits, vegetables, and ornamental plants adapted to the

¹ Prepared by a group composed of C. E. Rachford and E. R. Stauber, Department of Agriculture; Thomas C. Havell, General Land Office; Dr. Willard W. Beattie, Office of Indian Affairs; Karl G. Karsten, Works Progress Administration. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

southeastern region which is less favorable to livestock raising than the other regions and practically unsuited to grain growing.

KODIAK STATION

This station, located on Kodiak Island, was organized in 1898 and worked on cattle breeding and raising.

KENAI STATION

This station was placed in the large potential agricultural area on the west side of Kenai Peninsula in 1899. Its activities largely dealt with the breeding of cattle for dairy purposes. The station was discontinued in 1908.

RAMPART STATION

In 1900 work was started at this station on the Yukon River with respect to the breeding and development of grain and leguminous crops suitable for that region. The work was stopped in 1925.

COPPER CENTER STATION

Experimental work with vegetables, grasses, and grains suitable for Copper River Valley conditions was started here in 1903 but discontinued in 1908 because of killing frosts that almost invariably occurred in mid-August.

FAIRBANKS STATION

This Tanana Valley station was established in 1906 and gave particular attention to grain growing in interior Alaska and the maintenance of soil fertility.

MATANUSKA STATION

Cattle breeding and the growing of grain for livestock feed were the specialties of this experimental unit. Work was started in 1915.

Except as noted in the preceding paragraphs the work of the Department of Agriculture at the experiment stations was brought to a close in 1932. The Fairbanks and Matanuska Stations were taken over by



FIGURE 28.—Government Agricultural Experimental Station, Matanuska, Alaska

ROLPHE DAUPHIN

the Alaska University and are now the only units in operation. The latter has the status of a substation. The Federal Government extends substantial aid to this experimental work, the results of which furnish the basis of the material herein presented.

General Description

Alaska contains tillable land which can be made available for agriculture that is estimated at approximately 65,000 square miles. An additional 35,000 square miles suitable for grazing is also available. The principal areas are in the Matanuska and Tanana Valleys. Areas of minor importance are in southeastern Alaska, the Kenai Peninsula, and in the southwestern Alaska Healy Plateau.

Alaska is in general a mountainous country. Only the gentler slopes of the hills are arable. Practically every foot of soil has to be cleared before it can be put under cultivation. Clearing of the land is comparatively easy. Fires have destroyed a large amount of standing timber which could have been utilized for farm building purposes. Although Alaska has a considerable area of land suitable for production of agricultural crops, farming will necessarily be restricted to only a few areas because the country is thinly populated and transportation facilities are limited. The only a few areas because the country is thinly populated are the Matanuska and Tanana Valleys. The potential agricultural land of the Kenai peninsula is not accessible at the present time. The same is true of the Kuskokwim and upper Yukon regions.

Matanuska Valley

Land now farmed in the Matanuska Valley lies in an area about 15 miles long and 15 miles wide. As the region becomes more thickly settled farming may be somewhat extended.

Location

The farming area of this valley is located between parallels 61° and 62° north latitude and meridians 149° and 150° west longitude. It is bounded on the north by the Talkeetna Mountains, on the east and south by the Chugach Mountains, and on the west by the vast level plain of the Susitna River. The Matanuska Valley lies at the head of Knik Arm of Cook Inlet about 125 miles inland in a direct line from the open south coast of Alaska, and is reached by means of the Alaska Railroad.

Climate

The high latitude gives the Matanuska Valley long winters, short summers, and great variation in the length of day between winter and summer. About the

summer solstice the sun is below the horizon for only a few hours and there is no real darkness.

Climatic conditions are transitional between those along the coast and those in the interior. Grain may be grown as in the interior, but the winters are much milder and the growing season much longer.

The climate is influenced principally by the relatively warm waters of the Pacific Ocean on the south, the Alaska Range beyond the Susitna Plains on the west, the Talkeetna Mountains to the north, and the Chugach Mountains on the east. The moisture-laden winds from the Pacific Ocean sweep through Cook Inlet against the high mountains. Precipitation of rain and snow over the entire region is the result. The effectiveness of the mountains as barriers to the passage of moisture is indicated by the veil of fog and clouds that hangs so frequently over the southern slopes of the peaks. In contrast are the prevailing clear atmosphere and cloudless skies of the northern slopes of the Alaska Range.

Because of the modifying influence of the surface features and the warm coastal waters, the Matanuska Valley region has temperate summers, moderately cold winters, and a moderate rainfall. The climate is lacking in the extremes of temperature and the light precipitation that characterize the great interior valleys of the Yukon River and its tributaries. The mountain ranges also protect the region against the fierce blizzards. Long journeys may be taken at most any time in the Matanuska Valley. The region is free from tornadoes and severe electrical storms. Thunder and lightning occur so rarely as to be almost unknown.

The spring and early summer months have the lowest average precipitation. July, August, and September have the heaviest rainfall. The normal low precipitation for the early summer is not usually detrimental to crop growth.

Wind storms of sufficient intensity to cut the snow from cleared and exposed places are not common, but do occur frequently enough to endanger the life of exotic perennials, such as ornamentals and bush fruits. During May, as the fields dry and are prepared for seeding, occasional winds cause discomfort by blowing the fine soil from the field. If and when larger areas are cultivated, this condition will be aggravated.

Droughts of some severity have occurred in the region since farming was begun, but none of sufficient duration to cause crop failure. Rainfall in the latter part of the summer comes mainly in light showers and weather is often so cloudy as to be unfavorable for curing hay. At such times the hay is placed on racks or piled in cocks on poles set firmly in the ground. Artificial driers in use in the valley have been found an effective means of curing hay.

Beginning April 15 there are 14 possible hours of sunshine per day, but gradually the days increase in length. May 15 has 17 and June 15 about 20 possible hours of sunshine. After June 15 there is practically no darkness for several weeks. After June 22 the days begin to shorten, the decrease in length of day progressing at the same rate as does the increase previous to that date.

Total annual precipitation ranges from 13 to 18 inches. Less than half of this falls during the winter months as snow and rain. Warm spells, during which the snow may be melted entirely or reduced to a sheet of ice, are of rather frequent occurrence. Due to such periods, as well as to the winds that sweep the ground bare of snow, many plants of perennial nature are sometimes killed or weakened. The summer rainfall of from 8 to 11 inches, while not large, is ample for crop needs. The rather low summer temperatures and moderate winds are not conducive to rapid surface moisture evaporation or to heavy loss of water by plant transpiration. Also while the daylight hours are extensive, much of the time the sky is overcast.

Topography and Soil

Principal topographic features of the Matanuska Valley are the benches and lowlands with occasional irregular ridges. These benches and lowlands embrace a variety of soils ranging in texture from silt loam to fine sand. Drainage conditions vary from the well-drained benchland to the wet areas of peat and marsh. Before it may be cultivated the greater part of the land needs to be cleared of timber, undergrowth, moss, and any other thick covering of vegetation that may be present.

Exclusive of muskeg and muck, there are two broad soil groups in the Matanuska Valley—the soils of the benches and the soils of the stream bottoms. According to Bennett and Rice, the principal soils of the first group are the loam, fine sandy loam, and silt loam of the Knik series. These soils have developed on material which evidently has undergone considerable attrition by water or glacial action, or both, and which has been mixed, especially in the surface portion, with varying quantities of volcanic matter.

Although chemical analyses show that all the soils have a relatively high content of calcium, such analyses have not distinguished between the forms available and relatively unavailable for plant nutrition. Evidently this calcium has little significance for plant growth or soil development, because heavy applications of lime are required to correct acidity.

The benchlands, which vary in width from a hundred feet to several miles, constitute a great irregular plain that is continuous except for the occurrence of connected bodies of water. The plain rises through

successively higher benches, steplike, from a few feet above high tide to a maximum elevation averaging probably 1,200 feet above sea level, where it merges with the flanking mountain slopes. The greater part of the benchland is probably about 25 to 200 feet above sea level, although a few benches attain elevations of 2,000 feet. A common characteristic of the benches along the stream courses is their arrangement V-fashioned whereby they converge upstream, and spread out symmetrically downstream from the apex.

Drainage

Bottom lands drain quickly because of the sandy and gravelly nature of the soils and subsoils. Some strips of deep sand and soils underlain at shallow depths by gravel have excessive drainage. On these soils crops suffer from lack of moisture in dry seasons. On the other hand, numerous swales and depressions require ditching to establish drainage conditions favorable for agricultural use of the land, except for pasturage and hay production. Probably 75 percent of the bottom land is sufficiently well drained to be cultivated without ditching.

Large bodies of land both extremely poorly drained and well drained, less important areas possessing intermediate drainage, and still others having excessive drainage are to be found throughout the main part of the plain in the nonalluvial portion. These varying moisture conditions are determined very largely by the position and character of soil materials.

The good agricultural lands, such as the benches, hillocks, and ridges, are composed largely of the Knik loam soils. Mostly they are well drained even in localities far removed from streams. All these soils are gravelly in the substratum, and for this reason possess as nearly perfect internal and downward drainage as is possible.

Ditching is not necessary except when it is desired to give an outlet to the lower depressions. The deeper loams, such as the typical Knik loam, hold sufficient moisture, especially with proper soil management, to meet the requirements of all crops in ordinary seasons. It is estimated that 75 percent of the more valuable farming land of this region is well drained and capable of conserving ample moisture for crop needs.

Good water for domestic use is obtainable on all farms. Some farmers use the water from creeks. Others have to dig or drill wells ranging in depth from 15 to 60 feet or more.

Crops

Cereal crops, such as spring wheat, oats, and barley, grow well in the Matanuska Valley. Average yields per acre for the 6 years preceding 1937 were 22 bushels for wheat, 51 bushels for oats, and 24 bushels for barley.

(hulless). The usual time for seeding grain is about May 15, and the harvesting time is about September 1. The early wheat, such as Siberian, will ripen in less time and may often be harvested by August 20. Earliness is a desirable feature of grain produced in the region that applies to barley and oats, as well as to wheat. Early harvesting allows time for the grain to dry and harden before freezing weather.

Oats are usually grown both as a grain and as a hay or silage crop. Varieties that mature early are preferable for grain, even if they are not so tall or so high in yielding capacity as other varieties. The comparative coolness of the summer days usually delays the beginning of the harvest until after the warmest part of the summer has passed. It is sometimes difficult to cure the grain in the shock because the plants are green, and the air kept cool by frequent light showers. Oats for hay are cut and shocked before they are mature. Experience has shown that the crop cures more readily in shocks of not more than six bundles each than if it is cut with a mower and put up in cocks.

The main hay crop consists of oats and vetch. About 20 pounds of spring vetch mixed with about 100 pounds of oats makes a very desirable mixture for the average soil. The crop is cut with a mower and put up in small cocks over double-pointed stakes that are set into the ground for the purpose. A large spike is driven through the stake so that after the stake is set the spike will be about a foot above the ground. This method prevents the cock from settling on the ground and causes the outside to hang so that it will shed rain readily.

Oats and peas in mixture constitute the main silage crop. Since the object is to obtain as much forage as possible, the oat varieties used require a longer number of days to mature than do oats which are grown for seed. Canadian field peas are seeded with the oats. Yields vary from 4 to 6 tons of silage material per acre on average soil. The crop is always dependable because it can be harvested in the immature stage and taken from the field regardless of weather conditions. The cost of putting up silage at Matanuska ranges from \$2.48 to \$4.45 per ton.

Spring wheats of the earliest types, especially Siberian and Chogot, may be matured. Difficulty is sometimes experienced in curing the shocks in the field because of moist fall climate. Little demand exists at present for spring wheat in the immediate neighborhood other than as feed for poultry or hogs, and as part of the grain ration for dairy cows.

Barley has proved valuable as a grain feed. It grows well on all the upland soils and may be used either as a forage or as a grain crop. As a grain crop it takes the place of corn for fattening hogs and cattle.

Winter rye may be grown successfully. It is sown in the latter part of July and matures in August of the following year, occupying the field for two seasons. At present this crop is not grown to any great extent.

The potato has been an important crop in Alaska from the inception of agriculture in the Territory. Much of the soil in the Matanuska Valley is excellent for production of potatoes. On well drained and properly fertilized soils, particularly soils with a southern exposure, excellent crops are grown. Early varieties, such as those belonging to the Irish Cobbler, Early Ohio, and Triumph groups, are best. Yields of 300 to 400 bushels per acre of high quality potatoes of the varieties named have been harvested. This crop deserves to be given a prominent place in farm operations here in view of the heavy importation of potatoes into the railroad belt. In 1935, 1,180,000 pounds entered this region from the States.

Root crops, such as mangels, carrots, and rutabagas, yield abundantly. They are used to supplement silage or to take the place of silage where the farmer is not equipped with a silo.

Peas for canning yield heavily. Now that a cannery has been established at Palmer, this crop will undoubtedly be grown extensively since climatic conditions apparently are especially favorable for its growth. Peas are a valuable crop grown in rotation with grain and should become a part of every rotative cropping plan.

Clovers of many kinds have been tried for many years. Results have been inconclusive as to overwinter hardiness. In favorable years Alsike, sweet clover (biennial), and a Red clover of Russian origin have survived in good stand and produced excellent yields. Hope centers at present in the Russian variety. Seed, however, is unobtainable commercially. It therefore falls upon the experiment station to grow the clover and thus make seed available. Although this is being done, the original amount of seed was small and several years will be needed to produce an appreciable supply for distribution.

Alfalfa of the hardiest kinds obtainable has been tried with varying success. The hardier purple-flowered sorts, such as Grimm, Cossack, variegated, and Ladak, live over under favorable conditions. Snow cover is undoubtedly essential and sufficient available lime in the soil contributes to winter survival.

A yellow-flowered, sickle-podded variety of alfalfa is undoubtedly hardy. The seed in small amounts came from Siberia. The plant has a rather spreading growth, which detracts from its value as a hay crop. It is also slow in establishing itself and does not seed abundantly or with certainty. Once established in a

favorable location, it is very enduring and will stand considerable pasturing.

The most important annual legumes grown by the farmers in the Matanuska Valley are field peas and annual vetches.

All trials of fruit trees, such as apples, plums, and cherries, have given decidedly negative results. Dolga crabapples have lived for a number of years in favorable locations at the Matanuska Station. They have bloomed freely and ripened fruit. Many other kinds of the hardiest trees obtainable have lived for only a few years. In Anchorage and at points on Kenai peninsula some very nice appearing but immature apples have been displayed at Fairs. At Sitka, where the climate is quite mild, much experimental work was done in years past with a wide assortment of fruit trees. Results were not such as to encourage commercial plantings.

Bush fruits do astonishingly well. Heavy yields of red, black, and white currants are grown annually. Gooseberries do almost as well, but are subject to occasional winter injury. Raspberries of the red varieties produce splendid crops, but also suffer from cold if planted in an exposed situation.

Strawberries are an annual crop. All plants in the valley so far that have proved hardy have come from hybrid stock that originated at Sitka years ago. Even the hardy plants are occasionally winter-killed when and if the ground is swept bare of snow. Nevertheless, there are beds that have borne fruit for a number of years with and without care.

Exotic ornamental shrubs, such as the Siberian pea tree, bush honeysuckle, Japanese rose, and certain species of cotoneaster, are without question hardy and dicentra, and Gypsophylla. Extensive plantings have elder, mountain ash, and May day tree. Many herbaceous perennials are sufficiently hardy to warrant planting. Among them are delphinium, columbine, peonies, dicentra, and Gypsophylla. Extensive plantings have been made at the Matanuska substation. Often plants that have thrived and bloomed profusely for several years passed out due to unexplainable cause. Generally the reason has been believed to be severe winter weather, but that belief is not always justified. Many plants perish even where conditions are less exacting. Repeated trials are justified.

Livestock

Dairy cattle have a place in the farm operations of every good Matanuska Valley rancher. The Guernsey is the principal breed in the valley. Many of the cattle are either registered or eligible for registration. There are also a few Holsteins and a very few animals of the Brown Swiss and mixed breeds. The plentiful and

excellent feed that can be raised, the favorable climate, and a good local market for butter and other dairy products give the dairy industry excellent possibilities for expansion. During 1935 butter shipment from the Pacific Northwest into the railroad belt amounted to 500,000 pounds.

Less generally, the production of beef may be made profitable, particularly by those ranchers who have had experience and whose land is near or adjoins open range for summer use. Grass-fattened beef, however, will meet stiff competition from corn-fed, imported beef.

Hogs properly belong on every farm where cattle, particularly dairy cows, are kept. Skim milk, supplemented by home-grown grain, fed to pigs and shoats, is a sure, quick way to produce pork. On the well-managed farm various crops may be hogged-off to advantage. Young pigs have been found to develop rapidly on pasture grown from a mixture of rape (4 pounds), peas (1 bushel), and oats (1 bushel). The mixture will produce excellent feed for hogs all summer, provided not too many are kept in one area. The oats that have been pastured will send up new shoots, and when the fall rains are frequent will continue to make vigorous growth and will supply excellent succulent feed until the plants are killed by heavy frosts in September or October.

A farm flock of chickens of some standard breed, such as Rhode Island Red, Barred Rock, or White Leghorn, definitely belongs on every farm. The size of the flock should be governed by the ability and liking of the farmer for the work. It is well known that proper housing and careful attention are needed to produce eggs or fryers at a profit. Climatic conditions of this valley are not such as to make poultry raising unduly difficult. Since grain can be grown in sufficient variety and with certainty, most of the feed can and should be home-grown.

Excellent results with turkeys both at Matanuska and Anchorage show the possibilities in this phase of poultry farming. The dry weather of spring is favorable to the young turkeys at a time when they are sensitive to wetness. Suitable feed may be raised. In the fall there is a ready market for prime birds.

Beekeeping

Several attempts have been made with bees in Alaska in times past. An early attempt on record was made in 1905 at the Sitka Experiment Station, and even prior to that date several hives of bees were carried through by a priest of the Russian church at Sitka. At Anchorage a few years ago, and at the Matanuska Experiment Station in 1927, several stands of bees were tried. Results were just fair in all cases. The chief difficulty seems to be that of overwintering the bees.

Importing package bees every spring may possibly result in better success. Package bees were shipped in from California in 1936 for trial at the Matanuska Experiment Station. Four stands produced some very excellent honey, giving reasons to believe that honey may be produced at least during the better seasons, such as was 1936, with a reasonable amount of certainty.

Flowers producing nectar are sufficiently abundant to allow the bees to gather a good supply of honey. This is particularly true where fields of clover are available. One of the drawbacks to beekeeping is the low temperature which often prevails during the working season. The season of 1936 was considered ended by August 24, at which time the average weight of three stands was 106.5 pounds of comb and honey.

Markets

The markets to be supplied are confined largely to the railroad belt and center chiefly in Anchorage, a prosperous town of 2,200 population located about 35 miles distant by rail. A number of mines using considerable farm produce lie within easy trucking distance. Value of products which could have been produced locally but which entered the railroad belt from the States amounted to \$1,180,000 in 1935. The principal items were milk, beef, butter, eggs, pork, poultry, potatoes, mutton, cheese, and vegetables.

Transportation

The Matanuska Valley is traversed by the Alaska Railroad, which extends from Seward on Resurrection Bay through railroad headquarters at Anchorage and on to Fairbanks, a distance of 470 miles. Within the last 2 years an extensive road building program has been under way under direction of the Alaska Road Commission. In consequence there is a network of well-graded and in places graveled roads. Every settler has immediate access to a graded road in the main settled portion. During the winter drifting snow may stop automobile and truck movement for a short time. Snow plows are operated and roads quickly opened, however, particularly over routes traveled by school busses. A graded road extending from Anchorage to Palmer was completed in September of 1936 sufficiently to permit through travel by automobile.

Palmer is the center of community life in the Matanuska Valley as well as the center of the Matanuska Colony. It provides administrative, industrial, educational, and recreational facilities for the farming community. Practical assistance is given the farmers by the resident agricultural extension agent, the house demonstration agent, and the experiment station near Palmer. Six Homemaker's clubs, four 4-H clubs, and a Future Farmers of America club have been organized; also several social and fraternal organizations.

The Matanuska Valley Colonization Project

With the assistance of other Federal agencies, the Federal Emergency Relief Administration completed plans for a rural rehabilitation colony in the Matanuska Valley in March 1935. A total of 200 relief families were chosen from three States—Minnesota, Wisconsin, and Michigan. Of the 897 persons represented, only 43 were over 40 years of age. They were young, ambitious people of North-European stock, many with high school and special types of training.

Transients, woodsmen, and skilled mechanics were sent to Alaska from California in the spring of 1935 to begin the clearing of land and the construction of dwellings for the colonists. Transportation of colonists had been completed by May 30, 1935.

Each family was settled on 40 acres of Government land open for homesteading, much of which remained in timber. The soil was known to be fertile and capable of growing most of the ordinary farm crops. A primary objective of the colony, in addition to the economic rehabilitation of the selected families, is to furnish a local source of fresh vegetables and dairy products which at present are grown outside of Alaska and shipped in by water at high transportation cost.

A report dated December 14, 1935, stated that all houses had been completed, 101 barns built, 137 wells dug, and roads cleared and graded. By the end of June 1936, 270 acres had been cleared and 1,185 acres plowed and planted to hay, barley, wheat, oats, potatoes, and garden vegetables. In addition to supplying winter food for the colonists and their livestock, these crops provided a surplus for market. By October 55,000 pounds of vegetables had been stored in the community warehouse; a total of 100,000 pounds was expected by the end of the season. In addition, dairy products had been delivered for marketing. Prices were set by daily quotations on the Seattle market plus the freight rate to Palmer. Home preservation of large quantities of salmon and native berries was carried on during the summer.

Various community buildings have been erected in the civic center at Palmer which provide the essentials of a small modern town. Practical farming assistance is rendered by the resident agricultural extension agent, the home demonstration agent, and the Experiment Station near Matanuska. Cooperative marketing organizations have been established and the Government continues to supply farm machinery, equipment, livestock, and other capital items on a use-charge, lease, rental, or sale basis. The land-clearing program has been continued and a much larger acreage of crops has been planted. In February 1937 there were 166 families in the colony—135 of the original families and 31 new ones.

Tanana Valley

Location

The agricultural region known as the Tanana Valley lies 240 miles directly north of Matanuska. The two regions are separated by the rugged Alaska range. Tanana Valley lies between the parallels of 64° and 66° north latitude and the meridians 146° to 149° west longitude. The area thus bounded extends approximately from McCarty at the junction of the Goodpaster and Tanana Rivers to the town of Tanana where the Tanana River empties into the Yukon. Length of the valley between the two points indicated is approximately 205 miles by air line and 317 miles by river. The maximum width of the valley is 70 miles. The 7,000 and more square miles, or 4,480,000 acres, include in their physiography bottom or valley land and benchland. Many acres in stream beds, lakes, and swamps are not suitable for farming. The part of this vast section now being settled extends in a general way from Dunbar north about 10 miles, thence northeasterly to within a few miles of the Chatanika River, then southeasterly, crossing the Little Chena River, to near the junction of the Salcha and Tanana Rivers, thence following about 2 miles south of the left limit of the Tanana River to its junction with the Chena River, crossing the latter and passing Ester Dome to the line of the Alaska Railroad, and thence in a westerly direction to Dunbar. It is the northernmost region available for agricultural settlement in Alaska at present.

Climate

The frost-free period in this region extends from about May 20 to September 5. For the years 1932–36, inclusive, the highest temperature recorded was 89° F. in June and July 1932, and the lowest was –66° F. in January 1935. During the growing months, beginning with May, the normal temperature shows a steady rise until it reaches its peak in July.

The winters are cold and during the 2 months of lowest temperature the normal average for 1932–36, inclusive, ranges from –4° F. to –18° F. in December, and from –1° F. to –22.5° F. in January. The winter weather is healthful and invigorating, and the air is crisp and clear. The average annual snowfall for 5 years preceding 1937 was 59.39 inches. Lack of winds in this region permits snow to remain evenly distributed over the ground most of the time. It is usually light and feathery and remains in this condition for a large part of the winter.

During the growing season the days are long. On May 1 the sun rises at about 4 a. m., on June 1 at 2:30 a. m., on July 1 at 1:30 a. m., and on August 1 at 2 a. m.

The sun sets on May 1 about 9:30 p. m., on July 1 at 10:30 p. m., and on August 1 at 10 p. m. During June and July and parts of May and August twilight is continuous throughout the short night.

The total precipitation ranges from 8.5 to 16 inches. Approximately one-half of the precipitation comes during the growing season. Harmful erosion is almost negligible because heavy rain rarely occurs in this region.

All soils have a physical constitution that is well suited to absorb and retain rain. Because of this, together with short periods of drought and the low rate of evaporation, cereal crops may be produced with as little as about 8 inches total precipitation.

Dry weather in late spring and early summer sometimes checks plant growth to such an extent as to cause low yields, or subsequent moisture may prolong the growth and thus lessen the chance of maturity and increase the danger of injury by frosts. Drizzling rains and cloudy weather are common in late summer and may cause difficulty in curing hay. It is believed, however, that freshly cut vegetation does not deteriorate as rapidly in rainy weather here as it does in warmer climes.

Topography and Soil

Most of the land in the Tanana region is hillside or old river-bottom land. Hillsides with a southern exposure are considered the most desirable for farming because crops grown on them mature earlier than do those grown on river-bottom lands.

The lowland soils are productive and yield good crops of forage. They are prevailingly sandy, either from the surface downward or in the subsoil, and a large proportion has sand over the surface, or from near the surface downward. The soil materials are mixed in varying proportions, and the surface soil is intermingled with varying quantities of vegetable matter in different stages of decay. Soils in the Tanana Valley are said to be less acid than are those of the Matanuska Valley.

The Tanana very fine sand is the most extensive soil in the bottoms. It occurs throughout this great lowland area, but is relatively more abundant along the streams where there are many broad belts which do not include any important bodies of other soils. Spruce attains a surprisingly large size on this soil, showing no more tendency to scrubbyness over large areas than on the heaviest types, perhaps not so great a tendency. Trees 18 inches or more in diameter near the ground are common in many places. Birch is of some local importance, but it is considerably less abundant over this land as a whole than on the more loamy soils.

The Fairbanks silt loam is distinctly a slope soil. It is the best all-around agricultural soil in the interior of Alaska. It is well drained, yet retentive of moisture, shows only a moderate degree of acidity in either the surface soil or subsoil, is easy to cultivate, and is productive.

Crops

The most important farm crops in the Tanana Valley are grain and potatoes. Oats and barley are grown both for grain and for forage. Seeding is usually completed by June 1, and the crop is harvested by September 1. The yield of oats ranges from 36 to 75 bushels per acre, with an average of about 50 bushels. When early varieties are grown for grain and sown sufficiently early, they may be depended upon to mature every year. Earliness in maturity is not important when the crop is grown for forage.

Wheat gives an average yield of 20 to 25 bushels per acre. Early varieties, such as Siberian, Reward, and Garnet, are matured without difficulty. Only spring wheats are grown in this region.

Barley yields from 20 to 30 bushels per acre with an average of about 25 bushels. It grows well, and the grain is an important crop for dairy cows and hogs.

Hay is mainly a mixture of oats and field peas as in the Matanuska Valley. Bottom land is best suited for this crop. Yields up to 3 tons per acre have been secured. The greatest tonnage is obtained from seeding during the first 10 days in June. A general practice is to cut the crop either with mower or self-binder in September before hard freezing weather. If mowed, the hay is "stacked"; if cut with binder, the bundles are placed in small shocks. Drying proceeds slowly, but the cool weather checks mold. The hay generally has a high color and is very nutritious. Dairy cows at the University Farm were maintained in good milk flow fed exclusively on such hay.

What has been said concerning alfalfa and clover in the Matanuska Valley also applies to the Tanana region. The yellow-flowered alfalfa of Siberian origin (*Medicago falcata*) only has shown dependable hardiness. As proof there is a field of several acres at the abandoned agricultural experiment station at Rampart on the Yukon, which has maintained itself for more than 20 years, during which time several hay crops have been taken by a local resident.

Wherever the timber is destroyed and the surface vegetation uprooted, as in building roads, native grasses come in and flourish.

One of the chief crops of the Tanana Valley is potatoes. Since the beginning of agriculture here potatoes have ranked as the chief cash crop. On the market they have met stiff competition from potatoes grown in

Washington and other Western States. This competition has had a salutary effect, since it has emphasized the need of growing potatoes on southern slopes, thus taking advantage of the better drained, warmer soil, and longer growing season. Where this has been done and early varieties grown, the quality has met all market requirements. One farmer regularly produces from 10 to 12 tons of marketable tubers per acre. Yields range from 4 to 7 tons and prices from \$2.50 to \$5 a hundred pounds.

Hardy vegetables for the home can be produced in the family gardens. Both quality and quantity are assured where the garden is properly cared for. In a Fairbanks garden a cabbage weighing 42 pounds was grown.

Peas are an assured crop. In the sandy bottom land the vines make a strong growth and produce bountifully. On the stiffer soil of the slope earliness is accentuated somewhat at the expense of vine. Seed of any of the early varieties, such as Alaska and Gradus, has been produced regularly over a long term of years.

Currants produce dependable crops either red or white fruited, the latter outyielding the red. Best results have been secured on bottom land. Snow cover is essential. A bank of peat around each bush is helpful and should be left there permanently. The black currant is less hardy than the red or white. Red raspberries have been grown many years commercially. South slope land has produced excellent crops. A good mulch of straw is helpful in preventing too rapid drying of the soil. Winter protection is usually given by laying the plants or bending them down and covering with coarse litter.

Strawberries of hybrid origin have produced excellent crops. Mostly this fruit is grown in gardens for home use. One rancher produces on a commercial basis. The fruit sells readily at fair prices. Loss of plants through winter injury is of infrequent occurrence. At the abandoned Rampart Station a small field, uncared for, has produced regular crops for more than 20 years. Wild fruit, such as high-bush and low-bush cranberries, red raspberries, red currants, and blueberries, is fairly plentiful.

Livestock

This region is also well suited to dairying. Summer pasture is available for 4 months of the year, and during the rest of the time livestock must be fed. Oats, barley, peas, vetch, native grasses, and brome grass are all grown for winter feeding. Because of the cold winters all dairy barns should be well constructed and provided with artificial heat. Three dairy herds are maintained in the valley, two commercially and one at the university farm. The prevailing breed at all three is Holstein. Hogs can also be produced profitably in the

Tanana Valley. During the summer they may be pastured and in the fall fattened on barley, wheat, and peas. American Hampshire is the principal breed in the region.

Market

The thriving town of Fairbanks is in the heart of the agricultural region. The mining camps within a radius of several hundred miles are supplied with provisions from this point. Sixty miles from Fairbanks is the town of Nenana where products are sent for shipment by river steamboats along the Tanana and Yukon Rivers.

Transportation

Fairbanks is the northern terminus of the Alaska Railroad. This railroad, which is owned by the Government, operates trains throughout the year between Seward, seaport on the southern coast, and Fairbanks, the largest town in interior Alaska. Two arterial automobile highways extend out from Fairbanks. One of them, the Richardson Highway, 410 miles long, links Fairbanks with Valdez on Prince William Sound. The other, the Steese Highway, 160 miles long, connects Fairbanks with Circle on the Yukon River. In addition, a network of good automobile roads traverses the vicinity of Fairbanks and connects with points on the Alaska Railroad. Splendid airplane service is provided the year round.

Other Regions

Southwestern Alaska

The agricultural regions of southwestern Alaska include the Alaska Peninsula and the treeless islands beginning with the Kodiak-Afognak group, and extending westward to the extreme end of the Aleutian Island chain.

At the lower elevation on the mountain sides several types of grasses and a dense growth of mosslike plants form a good range for cattle during the summer. Large areas of beach rye and sedge grasses at the heads of bays can be harvested for hay and silage by means of mowing machines where the areas are not cut too deeply by small streams. These grasses make dense growth and attain a height of about 4 feet.

Numerous attempts have been made to raise livestock on the islands beyond Kodiak Island, but many have failed in the past and the present ventures have not yet achieved success. In this remote region the ranches must largely be serviced from Seattle and this city must furnish the principal market for the ranch products. The principal drawback is the lack of regular, reliable transportation. The direct distance from Seattle to Unalaska is more than 1,000 miles and can

be covered in 6 days. The route via Seward requires nearly 2 weeks. Freight charges for provisions are almost prohibitive and local mail steamers beyond Kodiak arrive only once a month. The last steamship dock to the westward is at Unalaska.

Ranchers must provide themselves with small boats for transportation between their ranches and the nearest steamship dock, and traveling in small boats on the open ocean should be attempted only on days of fair weather. Small livestock ranching will continue to be impractical west of Kodiak Island until better shipping facilities are available.

The Kodiak-Afognak Island group offers the best possibilities at present for livestock raising on a small scale. Ocean-going vessels call at the town of Kodiak at frequent intervals throughout the year. Ranchers go to Kodiak overland or in small boats. Some losses of cattle have been reported due to depredations of brown bears.

Kenai Peninsula

The western part of the Kenai Peninsula between Cook Inlet and the Kenai Mountains comprises some of the best agricultural land in Alaska. The climate is never severe, being neither extremely cold in winter nor hot in summer. It is tempered by the warm winds from the Pacific Ocean, which is less than 100 miles to the south in a direct line. The same kinds of crops that are being produced in the Matanuska Valley can also be produced here. The area of good agricultural land is more extensive than that of the Matanuska Valley and this region is attracting a large number of settlers.

The region is destined to remain undeveloped until economical transportation facilities can be provided. On account of the shallow waters which border the shores of Cook Inlet, large ocean vessels must anchor from 3 to 5 miles out. Small boats go up the Kenai and Kasilof Rivers for short distances on high tides. During the winter when the rivers are frozen over, practically no transportation facilities are available for the larger portion of this valuable agricultural land. With the advent of a wagon road connecting the towns of Homer, Ninilchik, Kasilof, and Kenai with the present railroad, this fertile region will undoubtedly become more settled. A road construction program is now in progress, several miles having been built in 1936.

Southeastern Alaska

Southeastern Alaska is for the most part nonagricultural. It is more densely populated than are other regions, however, and limited areas at the heads of bays and on the tide flats are being utilized for the

production of crops and livestock. Most of the small areas of land under cultivation are near towns which may be reached by small boats or from which roads have been built. The principal crops grown for the market are carrots, rutabagas, cabbages, potatoes, strawberries, and raspberries. There are about 300 head of dairy cattle in southeastern Alaska. The largest herds are located near towns. Milk produced in this region is bottled and supplied to the towns. Practically all feed for the animals is shipped from the continental United States. Farmers who do not live near the towns are dependent upon native tide flat grasses for forage for their livestock. The cost of clearing land in southeastern Alaska is prohibitive, and farming operations are, therefore, limited to home gardening, trucking, and producing hay on isolated grass-covered tide flats.

Healy

An area of about 200 square miles of land on the north slope of the Alaska Range with Healy as a center is believed to be a potential sheep-range country. Owing to its elevation this region is treeless. No snow lies on the ground longer than 3 to 7 days at any time because of the high winds. The native vegetation consists of several types of bunch grass and sedges, native redtop, low-bush cranberry, blueberry, dwarf birch, and dwarf willow. Enough native hay may be made to supplement the forage the animals obtain on the open range in winter. It is estimated that the carrying capacity of this range is 150 sheep per square mile. Range horses have been overwintered for several years.

Kuskokwim and Yukon Valleys

There are many thousand square miles of potential agricultural lands in the Kuskokwim and Yukon Valleys, but owing to their remoteness and inaccessibility, or because the main lanes of travel have become established elsewhere, they will undoubtedly remain undeveloped for a considerable period. These areas are covered with a mixture of spruce and birch, indicating that they are able to produce crops similar to those now being produced in the Tanana Valley. This was demonstrated by results obtained at the agricultural experiment station at Rampart on the Yukon River now abandoned.

Fortymile Area

There is another considerable body of agricultural land north of the Tanana River, between the Tanana and Fortymile, and more particularly along the South Fork of the Fortymile River. It has been estimated to contain 750,000 acres. This large area has as yet no transportation facilities worthy of mention. The

Bates Rapids in the Tanana River, some distance beyond Fairbanks, are of such a nature that only small and very powerful boats can pass them, and due chiefly to this cause there are very few boats that navigate to the upper Tanana.

Possibilities and Programs

The agriculture of the railroad belt which offers the best possibilities for expansion in the near future must be built around dairy products, poultry and eggs, sheep and wool, canning peas, potatoes, cabbages, and carrots.

Agricultural activities in the Fairbanks district are likely to expand less rapidly than in the Matanuska Valley owing to the great climatic extremes of the former region. With temperatures sometimes falling as low as 60° below zero in winter and rising to almost 100° above zero in summer, farming conditions offer more difficulties at Fairbanks; e. g., livestock barns must be provided with artificial heat during the winter months, less for protection against cold than for the purpose of keeping the barns dry. Owing to the low moisture-holding capacity of extremely cold air, the vapor from the breath of animals accumulates and solidifies on the walls and other objects and causes the barns to be very moist unless they are kept dry by artificial heat.

In addition to clearing land for the production of crops in the railroad belt, it is not only desirable but also necessary to develop small industries which will handle the products that may be produced successfully. The following are the most essential: creamery, cheese factory, canning factory for vegetables, and flour mill. A creamery and cannery are now in operation in the Matanuska Valley. Fairbanks has a small flour mill which has not operated for some years chiefly, it is said, because the local grain supply is diverted to other and more profitable uses.

Grazing

Reindeer were introduced into Alaska from Siberia, the first shipment being made in 1891. Subsequent shipments brought the total importation up to 1,280 head by 1902. Conditions proved so suitable that the original stock has expanded into a reindeer population conservatively estimated at 600,000 head. They are distributed over the coastal areas of Bering Sea and the Arctic Ocean from the Alaska Peninsula on the south to Point Barrow on the north. The original purpose of the importation has been accomplished; a dwindling source of native food supply consisting of game and fish has been augmented by a more dependable food resource. Proper range and animal management will insure the perpetuation of this valuable resource and the well-being of the native population.

These original shipments were accompanied by Lapland herders who taught the Alaskans the rudiments of old country reindeer husbandry, and who also acquired some property interests in reindeer herds. For several years no whites engaged in the industry, but gradually, as the industrial possibilities became more apparent, outside capital attempted to establish a commercial reindeer business. The industry made considerable headway until the start of the general economic depression. In the last year for which figures are available 1930 exports amounted to 20,000 hides and 2,500,000 pounds of meat. Surplus byproducts of the industry enter into the manufacture of many items of clothing and implements and provide an additional source of revenue. Since 1930 the commercial enterprises have shrunk and they are not likely to be revitalized due to the enactment of the Alaska reindeer law of 1937 under which all reindeer owned by whites are to be bought by the Government and managed for the benefit of the natives.

Prior to 1920 little improvement progress was made in methods of reindeer management, and no investigations had been undertaken of either the animals or their environment. With the advent of the white commercial enterprises the crude methods heretofore in use were soon found unsatisfactory. Practically every phase of the reindeer industry needed improvement including management of the range and herds, and handling of the products after slaughter. This led, in 1920, to the first scientific investigation of the problems by the Biological Survey, and later in 1928 to establishment of the Reindeer Experiment Station at College with substations at Nome and on Nunivak Island. Cooperating agencies included the Alaska University, Alaska Railroad, and several bureaus in the Department of Agriculture. Investigations to date have dealt with feeding, breeding, animal habits, morphology, range capacities, and packing plant methods.

Of the estimated 315,000 square miles of grazing land in Alaska, there are 200,000 square miles considered to be suitable only for reindeer grazing. Most of this consists of the vast stretches of treeless tundra bordering on the Bering Sea and the Arctic coast. Three distinct range belts exist—the coastal, far-interior, and coastal-valley regions. Climate and topography divide these belts into zones suitable for summer and winter grazing and these zones are classified into three main ranges—dry tundra, wet tundra, and rocky areas. Vegetation, varying in density with exposure, elevation, etc., comprises a mixture of lichens, shrubs, sedges, weeds, grasses, and mosses. Sedges and browse predominate on summer range, lichens and shrubs on winter range.

The reindeer range is on the open public domain under the administration of the United States De-

partment of the Interior. A survey by that Department in 1933 showed 78 native reindeer associations with 5,878 members, owning herds varying in size from a few hundred to many thousand head. Less than 20 of these herds were owned by other than natives. Supervision of native herds rests in the Office of Indian Affairs with local control centering on administrative units, each under the supervision of a field manager. The Department of Agriculture, through its Biological Survey and other bureaus, has the responsibility for conducting the research needed for the good of both the range and the animals.

The reindeer law of 1937 was enacted "to provide subsistence for the Eskimo and other natives of Alaska by establishing for them a permanent and self-sustaining economy; to develop native activity in all branches of the reindeer industry; and for other purposes." Its purpose is to make the reindeer industry a 100 percent native enterprise. This law is to be administered by the Secretary of the Interior who is authorized to do all things necessary to effectuate the purposes of the act.

The suitability of range for reindeer grazing is influenced principally by climate, forage, and topography. Since grazing must be on a year-round basis, each herd must be provided with suitable range to meet the needs of spring, summer, fall, and winter grazing. Herbaceous and shrubby vegetation which provides the forage on summer range grows rapidly and withstands heavy grazing. Lichens and mosses, however, which must be depended upon for winter range do not furnish an annual crop, grow very slowly and are easily destroyed by trampling or close cropping, especially under dry summer conditions. On many areas where reindeer grazing has been carried on for several years the original lichen cover has disappeared and been replaced by perennial species of vegetation not at all suitable to winter use. It is estimated that from 15 to 20 years may be required to rehabilitate some of these areas. Winter range must have complete protection during late spring, summer, and early fall, to insure perpetuation of the lichen cover and provide a sure source of winter feed.

A serious drawback to reindeer grazing in recent years has been losses due to predatory animals, especially wolves and coyotes. Other obstacles have operated to slow up native progress in reindeer management, including parasites and other insect pests, rigorous climatic conditions, the absence of transportation and communication in the interior, mixing of herds and ownership disputes, lack of marketing equipment, and the expense of shipping meat over 2,000 miles by water to market in the States.

Fire is very detrimental to the tundra vegetation. Areas adjacent to population centers and along routes

of travel show greatest fire damage, and in many cases large areas have been completely denuded as a result of repeated burning.

The reindeer industry in Alaska needs a program of protection and planned use. Investigations to date indicate a potential grazing capacity of 4,000,000 animals with a possible animal yield of about 1,000,000 hides and 150,000,000 pounds of meat. The 1930 population of the main area of Alaska included 24,211 Indians and Eskimos. The importance of the reindeer industry to the social and economic welfare of these native people can scarcely be overemphasized. Likewise the range conservation lesson driven home through devastation in the West following pioneer settlement should be heeded in Alaska. Otherwise, the cover resources eventually will disappear and with them the reindeer industry and the security it affords to the remote native communities.

An adequate program of protection and planned use should be established. A close integration of activities among the several Federal agencies concerned will be required for effective action.

Thirteen leases of public land for the grazing of livestock, other than reindeer, involving 894,348 acres of land in Alaska are outstanding. On one of the islands of the Aleutian Group over 12,000 sheep are grazed under a lease from the United States. The grassy lands on the south side of the Talkeetna Mountains offer possibilities for grazing sheep in connection with the farms of the Matanuska Valley.

Homesteads²

Homestead entries may be made as a matter of right by those qualified under the homestead laws to make such entries on any vacant, unreserved, surveyed lands in Alaska and rights to make homestead entries may be initiated on any vacant, unreserved, unsurveyed lands in Alaska. Homestead entries may be made for lands in national forests only after the lands sought to be entered have been classified by the Secretary of Agriculture as agricultural in character. Capital to the amount of approximately \$2,500 is considered necessary to homestead successfully. Most of the forest homestead entries have been made in southeastern Alaska. An examination of the records in the General Land Office reveals that the percentage of entries made in southeastern Alaska that passed to patent is more than twice as great as the percentage of entries that passed to patent in the balance of the Territory.

² For more complete information regarding homestead entries see Information Relative to the Disposal and Leasing of Public Lands in Alaska, Circular No. 1349, General Land Office, and Information, Laws, and Regulations Relating to Public Lands in the Territory of Alaska, Circular No. 491, General Land Office.

It is suggested that consideration be given to the allowance of the homestead entries only after the land sought to be entered has been classified as agricultural in character in order that the chance of perfection of the entries made may be increased and that lands more valuable for other purposes may be not thus diverted to agricultural use.

Marketing

One of the limiting factors to extensive farming is the lack of large markets. Alaska has a total population of about 60,000 people. Half of this is Indian and Eskimo, of low purchasing power; also, the native people live mainly along the southern and far northwest coasts and cannot be supplied economically with produce from the farms in the railroad belt. About one-third of the white population lives in southeastern Alaska, and can be supplied with farm products more economically from Seattle, Wash., than from interior Alaska. The approximately 7,500 people who live in the Alaska railroad belt reside mostly in Anchorage, population about 2,200; Seward, population about 1,600; and Fairbanks, population about 3,200. The remaining 500 live in small villages or in isolated prospecting and trapping cabins tributary to the railroad. A considerable portion of these people find it necessary to use canned-food products and therefore only a limited amount of Alaska grown foodstuffs can be sold to them until local canned materials are more widely available.

The Matanuska Valley Farmers Cooperative Association was set up in June 1937 as the marketing agency for the valley farmers, both the original colonists and the project settlers. All classes of agricultural products grown in the valley are handled.

Most of the Alaskan agricultural products are bulky and cannot be exported profitably. The products which will probably be produced in sufficient quantity will be dairy products in the form of butter and cheese, and perhaps canned peas. Potatoes cannot be shipped profitably out of Alaska because the approximate freight rate from Matanuska to Seattle is 2 cents per pound, and the selling price of potatoes in Seattle is frequently less than 2 cents per pound. All other farm products should be grown only in sufficient quantity to supply the population along the railroad belt.

Soils

Owing to severe wind erosion, something should be done to conserve the soil. During the winter months and also in the spring, which is the dry season, many farm lands have deteriorated severely as a result of wind erosion. Steps should be taken to prevent this loss by planting strips of native trees at right angles to the prevailing direction of the winds; also, in clear-

ing lands in the future, strips should be left uncleared in order to check wind erosion.

Because of comparatively little bacterial action in the soils resulting from short summers, considerable experimental work needs to be done on the maintenance of soil fertility, especially in those sections where the layer of soil which was deposited by wind is comparatively shallow.

Mosquito Investigations

Mosquitoes represent a serious handicap to farming operations. They attack human beings and livestock to a degree that seriously impedes farm operations. It is necessary for men who work in the fields during the months of May, June, and July to wear head nets and canvas gloves. A number of farmers prepare smudges in the pastures so that when cattle are tormented seriously by mosquitoes, they have an opportunity to stand in the smoke for relief. Mosquitoes are controlled inside of the houses by burning an insect powder known as buhach. Further investigations are necessary to determine whether or not it is desirable to provide field shelters equipped with mosquito repellants for the relief of grazing animals.

Recommendations

Mapping of Vegetative Cover Types

All planning work for the organic resources of Alaska calls for a knowledge of the extent of the several major vegetative cover types. This information may be obtained most readily in connection with the aerial surveying that should be conducted as a part of a topographic mapping program. Recommendation is made that this work be started at an early date and extend over the entire Territory.

Agricultural Experimental Work

Recommendation is made that the personnel and facilities for agricultural experimentation by the Alaska University be strengthened. The scientific work of the central station at the university and of the substation in the Matanuska Valley should be enlarged. Additional substations to study the peculiar problems of the several other distinctive vegetative regions should be established.

Economic Surveys

An economic survey of the Matanuska and Fairbanks regions is recommended in order to obtain information which will be useful in assisting the farmers in marketing their produce. Practically all of the food-stuffs consumed in Alaska have been imported for many years from Seattle. A regular routine has been established and merchants are in the habit of obtaining all of their goods through Seattle wholesalers and

jobbers. This is perhaps the easiest course to take because Seattle products are graded and the merchant knows what he is getting when he telegraphs his order. The merchant has not known where to locate the local farmer with products for sale nor has he known what the quality of the produce might be nor the price at which it might be bought. The result has been that merchants have shipped produce from Seattle when such goods were available in Alaska. The recent establishment of the cooperative association for Matanuska will improve this situation but a thorough economic survey is needed.

Farm organization and management studies are also recommended to supply factual data concerning the sizes and types of farms and the internal farm organization likely to be most successful in the several areas. These farm management studies should be so oriented that they will contribute to the development of satisfactory cropping systems and soil management practices for erosion control and soil fertility maintenance.

A land-use planning study is also recommended to develop an economic classification of the various areas and subareas in terms of their suitability for agriculture. Such land classification study would involve the synthesis of physical, economic, and social data into recommendations concerning desirable patterns of land occupancy and conditions of land use. It is in a new area such as this that land-use planning can be made an effective means of guiding land settlement into the most advantageous situations and thereby avoiding many mistakes which mean poverty, human destitution, and wastage of resources.

Soil Survey

A preliminary soil survey was made of the Matanuska and Tanana Valleys in 1914 and a report was issued in 1915. A detailed survey should be made of both regions and a portion of the Kenai region in the near future. The surveys should later be extended to other parts of the Territory.

The development of agriculture in Alaska, as elsewhere, necessarily will depend upon the ability of the individual farmer to adjust his farming practices and economy to natural conditions. It is immediately obvious that climate, relief, soils, and native vegetation are highly important factors in determining the localities most suited for more intensive agricultural development. This type of information is best achieved through the reconnaissance soil survey.

In those localities in which the above factors are favorable the actual type of farming to be followed, the kinds of crops that may be grown, the size of farms that are economically advisable, and the total agricultural population that may be supported are determined in large part by the types of soil and their distribution

in relation to each other. The detailed soil survey, by showing the distribution of soil types on a map and describing their characteristics and inherent suitability for specified crops and by giving recommendations for their use, supplies this need of detailed information for a given area. These types also furnish the units to which fundamental research in agriculture can be directed.

Recommendation is made that detailed soil surveys be conducted in the four principal agricultural areas: (1) Matanuska area, (2) the Tanana Valley, (3) a portion of the Kenai Peninsula, and (4) Fortymile area.

The total area recommended for early survey is approximately 850 square miles. With a field season of about $3\frac{1}{2}$ months of working days, it is estimated that 12 men will be needed to complete the work in one season, or 6 for 2 seasons.

Whole-Milk Supply for Cities

Recommendation is made that as soon as the dairy farmers of Matanuska Valley produce whole milk in sufficient quantity to supply the needs of the city of Anchorage, a daily milk car be operated on the Alaska Railroad between Wasilla, Palmer, and Anchorage. Dairymen now supplying whole milk to Anchorage residents from herds fed on imported hay should be encouraged to sell their herds at that time and purchase whole milk from Matanuska farmers and bottle it for the local retail trade.

Sheep Investigations

Recommendation is made that an investigation be conducted of the possibilities of utilizing the grassy lands above timber line on the south side of Talkeetna Range as supplemental pasture during the summer months, for sheep. This region is connected by road to the agricultural lowlands of the Matanuska Valley and is thus quite accessible to the Matanuska farmers. The investigation is expected to indicate that a small flock of sheep should be kept on most of the farms in the Matanuska region.

Subsistence Homesteads for Alaska Natives

The increasing dominance of white culture in the southern areas of Alaska is definitely modifying the bases of native life. It is not enough to assume that the native will find a satisfactory living through periodic employment as longshoreman or as a worker on the Alaska Railroad, or in the fisheries industry, or in some other form of wage service. It is desirable that an attempt be made to open up new avenues of subsistence activity to the native, provide adequate training so that he may enter such activities with some

prospect of success, and reserve for him some of the lands of the Territory which he may learn to use to advantage with this newer training.

The Federal vocational school at Eklutna has been established in an endeavor to furnish certain phases of this new training. The Office of Indian Affairs has recently recommended the enlargement of the school reservation at Eklutna to make possible further training in agriculture and experimentation with the cultivation of fur-bearing and other animals, with the expectation that vocational work along these lines will greatly expand the possibilities open to student graduates.

The Office of Indian Affairs has also requested the setting aside of a reservation of suitable agricultural land on the Kenai Peninsula with frontage on Cook Inlet, which will allow for the establishment of a colony of school graduates trained in agriculture who may make their permanent homes on this reservation, supplementing their agricultural produce with fishing in the waters of Cook Inlet.

The Federal Government, through the passage of the reindeer bill in 1937, has definitely committed itself to the preservation of reindeer culture as an exclusive native industry designed to support many of the natives of Alaska. Of the estimated 315,000 square miles of grazing land in Alaska, reports indicate that approximately 200,000 square miles are suitable only for reindeer grazing. In view of the recent limitation of the reindeer to the Alaska native, it is recommended that further steps be taken to set aside the reindeer grazing lands along the coasts and rivers as permanent reservations on behalf of the Alaska natives.

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RECREATIONAL RESOURCES AND FACILITIES¹

Introduction

Alaska is the last great primitive region under American control. In extent this last frontier is an empire. It is about one-fifth the size of the continental United States, or about equal to the area north of the southern boundary of the State of Tennessee and east of the Mississippi River.

It is a land of great and diversified natural resources, and especially rich in recreational values. Superlative are its abundant and diversified snow-clad ranges, magnificent glaciers, and superb fiords. Its wildlife resources are equally outstanding. Today it is one of the world's greatest game areas. Its abundant opportunities for the hunting and observation of wildlife, and for fishing, carry a strong appeal to the American vacationist. To these recreational factors must be added the lure of the frontier with its continuing appeal to the American temperament. Here unattained summits, unexplored rivers, and unknown glaciers await the explorer. For the less hardy there are tourist trips of great beauty, camping, winter sports, and close contact with nature. So great is Alaska's variety, abundance, and distribution of natural recreational resources that more than one authority believes that if properly protected they constitute a potential economic asset which will eventually prove a greater source of revenue than the returns derived from her minerals, furs, and fishing.

Comparatively little use is being made of these enormous recreational resources. The number of tourists has shown a marked increase in recent years, but the total still remains relatively small. A number of factors are responsible for this, which also account in large measure for the present undeveloped state of Alaska.

First, there is the small population. According to the census of 1930, there were only 59,278 people in the Territory. Of this number, 28,640 were white. That is about one person for every 10 square miles. There is also the factor of isolation. The distances involved are of continental magnitude. From Puget Sound to the nearest Alaska settlement is a journey of some 500 miles; to the farthest settlement about 3,000 miles. The topography in the more habitable areas is of an

extremely rugged type. Highways are few and far between. In an area of 586,400 square miles there are only approximately 2,298 miles of highways. One cannot travel by road from our Pacific Northwest to the Territory. There are not even means of driving directly to the Mount McKinley National Park, the second largest of our national parks. Travel in the Territory is largely by boat and consequently slow. At the present time the usual trip by boat from Seattle to Seward requires 6 days. Air travel is, however, increasing rapidly.

The great distances involved and the lack of highways make travel in Alaska costly. A typical tourist itinerary from Seattle to the interior of Alaska and return involves about 19 days and entails an outlay for passage and meals of about \$250. The time and cost involved places such a trip outside the possibilities of the average American family living in the Pacific Northwest. These handicaps are further intensified by the lack of hotel accommodations and transportation facilities within the Territory. These are inadequate for the present volume of the tourist trade. The present size of the trade, coupled with the shortness of the tourist season, makes private capital hesitant to provide expanded tourist accommodations. As a result, comparatively little private capital is invested in the development of the Territory's scenic resources.

Yet, notwithstanding these facts, the tourist trade is today a very important factor in Alaska's economic life, and is destined to become of even greater importance. Efforts have been made to secure data on which to base an estimate as to the number of tourists and their average expenditures in Alaska. In the limited time available, however, it was not possible to arrive at a satisfactory estimate.

Alaska's recreational resources have been scarcely tapped. They are capable of far greater utilization. That they have a popular appeal needs no proof. More and more tourists, hunters, scientists, naturalists, photographers, and painters are turning to the North for their recreation. Even under present conditions, their number will increase owing to the growth of population in the United States, the ever-increasing amount of leisure time at the disposal of the public, and the growing recognition of the need and value of recreation. This trend can be stimulated by carrying out certain recommendations made later in this report. While such recommendations are based on recreational needs and facilities, they will be integrated as far as

¹Prepared by a group composed of John Cameron, National Park Service; Robert Marshall, Forest Service; and Paul W. Gordon, Alaska Railroad. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group. See Appendix B for a separate statement by Robert Marshall.

possible and form part of a Federal program of varied and related activities, having as their aim the greater development of the Territory along sound conservation lines.

The present undeveloped state of Alaska's resources, both industrial and recreational, makes it possible under principles of good recreational planning to develop a recreational program on a Territorial basis. Such a plan should have for its objective retention of recreational resources in perpetuity not only for Alaska's present and future needs, but also for the future requirements of the continental United States. Wisely planned and coordinated, these potentialities can be made the basis of an increased tourist trade, with a resulting large economic contribution to the Territory. No less valuable will be those intangible gains which accrue from a citizenry adequately provided with a wide range of recreational interests.

In her present undeveloped state, the Territory offers an unusual opportunity to avoid certain mistakes which were made in developing our own great West:

Present conditions in Alaska with respect to lands resources are comparable to those which prevailed in the West 60 or more years ago before the great tide of western settlement was well under way.

To avoid mistakes similar to those made in connection with the development of the West, and to correct certain bad practices, a program of protection and planned use should be initiated at an early date for those extensive public-owned resources of Alaska which have not yet been brought under careful management.²

Practically all of Alaska's lands are owned by the Federal Government. Probably not 1 percent has passed into private ownership. Of its total area of 378,165,760 acres, some 27,148,199 acres are included in existing national parks, monuments, and forests. As most of the population lives along the coast and is engaged in industrial pursuits, there has been to date no extensive use and development of available land resources.

Appraisal of Alaska's Recreational Resources

Available Data

No comprehensive survey of Alaska's recreational resources has yet been made. Data, however, are available for the various existing Federal recreational areas, and their components, such as wildlife refuges.

A detailed study of the Territory's present and future recreational needs was authorized by Congress in 1936 when it passed the Park, Parkway, and Recreational Area Act, Public, No. 770 $\frac{1}{2}$. That act authorizes and directs the Secretary of the Interior, through the National Park Service, to cooperate with the States, Territories, and other Federal agencies in conducting a nation-wide study of public park, parkway, and

recreational area programs and to join with such agencies in formulating plans to meet the recreational needs of the people.

Other Federal agencies are cooperating in this recreational study. These agencies are furnishing factual information regarding existing and potential recreational facilities on areas under their jurisdiction. The Department of Agriculture, for instance, has compiled data regarding the recreational facilities existing within national forests in Alaska.

Because a large part of the Territory is comparatively unknown, the existing data on present and potential recreational resources are fragmentary. Less than half of the Territory has been mapped on any scale. Maps are available, however, for the major parts of existing Federal recreational areas.

There is sufficient information available to sketch in a general way the extent of its recreational resources. Information is available concerning the extent, use, facilities, and accommodations within existing Federally controlled recreational areas, such as national parks and monuments and national forests. Certain generally recognized handicaps militating against the greater development and utilization of the Territory's established recreation areas and resources will be pointed out. Enough facts are also at hand to serve as a basis for certain recommendations, which, if carried out, will make these scenic areas more accessible and at the same time insure under principles of sound recreational planning sufficient facilities and primitive areas for that day when Americans will journey to the North in increasing numbers.

Natural Recreational Resources

In considering the present development of Alaska's recreational resources, let us begin with a general description of her natural features which, so to speak, constitute the basic raw materials.

The nature and value of these and their possible contribution to the economic life of the Territory is suggested in the following description written in 1901 by Henry Gannett, then Chief Geographer, Geological Survey:

There is one other asset of the Territory not yet enumerated, imponderable, and difficult to appraise, yet one of the chief assets of Alaska, if not the greatest. This is the scenery. There are glaciers, mountains, and fiords elsewhere, but nowhere else on earth is there such abundance and magnificence of mountain, fiord, and glacier scenery. For thousands of miles the coast is a continuous panorama. For the one Yosemite of California, Alaska has hundreds. The mountains and glaciers of the Cascade Range are duplicated and a thousand-fold exceeded in Alaska. The Alaska coast is to become the show

² Alaska From the Western Range.—A Great but Neglected Natural Resource. Senate Document 199, Separate, No. 17, by B. F. Heintzleman, Principal Forester, U. S. Forest Service, 1936, p. 581.

place of the earth, and pilgrims, not only from the United States but from far beyond the seas, will throng in endless procession to see it. Its grandeur is more valuable than the gold or the fish or the timber, for it will never be exhausted. This value, measured by direct returns in money received from tourists, will be enormous; measured by health and pleasure it will be incalculable.³

Mountains

Alaska's mountains have great recreational potentialities. The Pacific coast is embraced by an immense semicircle of mountains extending all the way from the southern extremity of the Territory to the end of the Aleutian Islands. The ranges in this group include the St. Elias, Chugach, Kenai, and Aleutian. Far northward lies the Brooks Range which separates the Yukon River Valley from the Arctic slope. These important groups are supplemented by numerous lesser chains, each of which in most countries would be of outstanding interest.

No less conspicuous are these mountains for their great variety and beauty. Along the coast are thousands of square miles of enormous peaks debouching glaciers. Hundreds of these peaks have never been scaled, although every summer has its quota of climbing parties. Contrasting with those that rise abruptly from the sea and are mantled with the rich forests are the interior ranges which sweep the sky in utter desolation. Here is the Alaska Range with its well-defined crest line, dominated by Mount McKinley, 20,300 feet, the highest peak in North America.

Volcanoes

There are two important volcanic mountain ranges in Alaska. One is the Aleutian Range which stretches through southwestern Alaska and is continued in the highlands of the Aleutian Islands, and the other is the Wrangell Mountains, lying approximately 200 miles east of Anchorage.

The Aleutian Range includes a number of active and dormant volcanoes which contribute to make Alaska one of the best defined volcanic areas in the world. These natural wonders attract scientists annually. Because of their proximity to the sea, which allows comparatively easy accessibility, they undoubtedly will prove a strong tourist attraction.

Nearly all of the active volcanoes are in the Aleutian Range and on the Aleutian Archipelago. Only two outstanding volcanoes are outside of this region. One is Mount Edgecumbe, in the Alexander Archipelago, the only known volcano in southeastern Alaska, and the other is the Wrangell Volcano in the Wrangell Mountains. On the Alaska Peninsula there are at

least 12 active or quiescent volcanoes. The Aleutian Islands contain a much larger number, one or more of which is almost always active.

A number of the larger volcanoes have been active in recent times, such as the St. Augustine in 1883, Kugak probably in 1889, Veniaminoff in 1892, and Mount Katmai in 1912. This last mountain with its famous "Valley of Ten Thousand Smokes" is located at the head of the Alaska Peninsula, and forms part of the Katmai National Monument.

Coastal Waterways

The beauty of the mountains is accentuated and made accessible by the tongues of the sea, which have invaded the gorges, drowned the valleys, and produced an intricate system of tidal waterways. Some of these are broad expanses of water dotted with islands. Others resemble great river gorges extending far inland of great depth, restricted by beetling cliffs. Hundreds of miles of navigable channels exist.

The most striking of these waterways are the gorges or fiords, of which Glacier Bay and Portland and Lynn Canals are the most notable. They extend inland for 60, 100, and 175 miles, respectively. Some sections are remarkably straight, others sinuous. For many miles they are bounded by sheer walls, rising in places to peaks 8,000 and 9,000 feet above the sea. The shores are broken in places by embayments fed by tidewater glaciers. "The sea bottom usually falls off abruptly close to land, often reaching a depth of 60 or 70 fathoms within a few yards. The deepest soundings thus far made register 300 to 400 fathoms."⁴

This type of scenery, which is one of the outstanding tourist attractions in Scandinavia, is extensively duplicated in Alaska.

Rivers and Lakes

The many and widely distributed rivers possess marked recreational possibilities. The Yukon River drains one of the world's largest watersheds. It flows for about 1,350 miles through Alaska and is extensively navigated during the summer. Tours along the upper part are one of the popular tourist trips.

The Territory also abounds in clear streams, waterfalls, and lakes, which combine beauty with unequal opportunities for camping and fishing. The lakes are numbered in thousands. The largest and best known are confined to the mountains along the southern coast.

Glaciers

Of the Territory's varied scenic attractions, none have a greater appeal than its glaciers, which cover

³ Harriman Alaska Expedition, Doubleday Page & Co., vol. II, General Geography by Henry Gannett, pp. 276-277.

⁴ Brooks, Alfred H. The Geography and Geology of Alaska. Geological Survey Professional Paper No. 45, p. 19. 1906.

about 20,000 square miles, or a little more than 3 percent of its total area.⁵

Most of the glaciers in the coastal ranges slowly move seaward, melting as they move until finally their waters pour into the many fiords which penetrate the coastline. The glaciers that feed Glacier Bay actually are tide-water glaciers and do not melt until after they break off in the water. This type is limited in number.

The glaciers of Alaska are almost exclusively limited to the ranges bordering the Pacific Ocean, such as the St. Elias Range, the Chugach Mountains, the Kenai Mountains, and the Coast Range along the Canadian border in southeastern Alaska. Inland glaciers occur in the Alaska Range and the Wrangell Mountains.

High elevation and heavy precipitation largely account for their distribution. The coastal mountains, for instance, reach altitudes of 15,300 feet in Mount Fairweather, 18,008 and 19,850 feet in Mounts St. Elias and Logan, and 6,000 feet in the Kenai. The Wrangell Mountains have a number of peaks from 12,000 to 14,000 feet high. In the Alaska Range there are Mount Hayes, 13,740 feet; Mount Foraker, 17,000 feet; and Mount McKinley, 20,300 feet. The most important centers of glaciation are, therefore, closest to travel routes, an important fact in considering their recreational value.

Alaska's glaciers are unique because of their extent and beauty. Also of special significance is the fact that glaciation in Alaska has been continuous since Pleistocene time, which began about 2 million years ago. In other words, the glaciers of today are remnants of the much larger glaciers which covered northern North America during the ice age. They offer an unusual field for scientific study. They also represent one of the Territory's chief tourist attractions and will be visited by ever-increasing numbers as better means of approach are provided.

Hot Springs

Thermal and mineral springs are widely distributed in Alaska. Their hygienic values were early recognized by the Russians, who built bath houses adjacent to several, notably near Sitka.

Of 109 springs listed by Waring in his "Mineral Springs of Alaska," Water Supply Paper 418, Geological Survey, 1917, 75 were hot or warm springs, 17 carbonated or "soda," 13 cool sulphur springs, 3 iron, and 1 salt. These are found for the most part in well-known places in southeastern and southwestern Alaska, the Yukon Basin, and on the Seward Peninsula. Few are known in northern Alaska, mainly be-



COURTESY WORKS PROGRESS ADMINISTRATION

FIGURE 30.—Tourist Party at Columbia Glacier

cause this area has been little explored and geological factors are not so conducive to hot springs.

Climate

It is difficult to generalize about the climate of Alaska because of its great size and varied topography. It is not often realized that the range of climate is greater than that between Florida and Maine. This wide variation is due partly to a latitudinal extent equal to that between Mexico and Canada and partly to the temperatures of the oceans that wash Alaskan shores. The greatest climatic influence is the distribution and altitude of the high ranges.

The south region, exposed to the warm winds and waters of the Pacific, has a comparatively warm climate. This area is rainy, cool in summer, and never exceedingly cold in winter. The mean temperatures during the summer months of June, July, and August, range between 50° and 55° F., and during the winter, between 20° and 35° F. The annual rainfall is great, varying between 50 and 190 inches, the greater part of which falls during the winter months. No perma-

⁵ Capps, Stephen R. Glaciation in Alaska in *Shorter Contributions to General Geology*. Geological Survey, Professional Paper 170, p. 1. 1931.

nently frozen ground is found along the coast. In contrast, much of that in the north and in the western part is permanently frozen to bedrock.

About one-fifth of Alaska lies within the Arctic Circle and has a mean summer temperature of 38° to 45° F., and a mean winter temperature of -16° to -10° F., with an annual precipitation of 6 to 8 inches.

The interior of Alaska, accounting for about three-fifths of the Territory, is characterized by three high mountain ranges, high plateaus, and broad flat valleys. The summers are short, with mean summer temperatures between 50° and 58° F., and long winters between 0° and -20° F. The usual total rainfall is between 7 and 20 inches.

Wildlife

The Territory is exceedingly rich in wildlife, which constitutes one of its chief sources of wealth and income. Its value on the hoof in 1936 was estimated close to 100 million dollars.⁶ Game is an important source of food. There are about 8,000 inhabitants engaged in trapping. Furs shipped from Alaska in 1936 had a value of \$1,932,893.⁷

The great abundance and variety of wildlife also serves as one of the leading tourist attractions, as shown by the increasing numbers of visiting hunters, photographers, and students of wildlife. The preservation of these wildlife resources, therefore, is a matter of great concern not only to the people of the Territory, but to all Americans who are vitally interested in measures affecting the conservation of Alaska fauna.

The location of the principal wildlife refuges in Alaska is shown by the accompanying map, which also shows the Mount McKinley National Park and the various national monuments. These are also game sanctuaries.

Of foremost interest to hunters and students of wildlife are the Alaska brown bears, which are the largest carnivorous animals in the world. They are found along the coastal sections of Alaska, and have a range of not less than 100,000 square miles. Other big game animals are the various species of grizzly bear; the polar bears of the Arctic Seas; the moose, found in most of the timbered sections; and the white mountain sheep, plentiful in the Alaska Range, in large sections of the Brooks Range, and along certain parts of the south coast.

Most numerous of all the big-game animals is the caribou. Wandering herds of these form one of the most important attractions of the wilderness portion of the Territory. They are widely distributed

throughout the high country of the interior plateau region, the Alaska Range, and Brooks Range, and along the Alaska Peninsula. Their total number is estimated at between 1 and 2 millions. The largest herd, the Yukon-Tanana, Murie estimated at 568,000.⁸ These herds have occupied a place in the life of Alaska comparable to that filled by the bison in the early development of our West. Even today they furnish the chief source of fresh meat for isolated settlers.

Caribou are destined to become of increasing importance to the Territory. They will continue to add more and more to the pleasure of the visiting sportsmen, and particularly so to the student and observer of wildlife. Their greatest value, however, will be as a game resource.

The growth of the reindeer industry in Alaska constitutes the chief menace confronting the caribou today. The disappearance of the caribou along the Bering Sea and Arctic Coasts was inevitable because of the development of reindeer herding in that region. As reindeer and caribou should not occupy the same range, it seems advisable to designate certain parts of the Territory, in which each may expand under natural conditions. For instance, the ranges set aside for the caribou might be confined to eastern Alaska, which is less suitable for the reindeer and at the present time occupied by extensive herds of caribou.

Any mingling of reindeer with caribou herds should be discouraged. That course results first in large losses through strays. In the second place, it leads to inevitable hybridization with deleterious effects upon both reindeer and caribou. The caribou is a larger animal than the reindeer and interbreeding will cause it to lose its distinction of being the largest of its kind on the continent.

As a game resource it is important that the interior herds of caribou be kept pure. As the principal herds now existing roam to and fro from Yukon Territory and Alaska, concerted action by the United States and Canada would seem necessary. Whatever regulations are made should be of a flexible nature to meet changing conditions. As the animals require much territory care should be taken to provide adequate range. Ample provision should be made to anticipate any changes arising from the time when the Territory will be more thickly populated.

Game Fish

With its abundance of game fish of large size, the Territory is an angler's paradise. Trout and grayling fishing and salmon trawling are among the most popu-

⁶ Report of Governor of Alaska, 1937, U. S. Department of the Interior, p. 24.

⁷ *Ibid.*

⁸ Olaus J. Murie, *Alaska-Yukon Caribou*, North American Fauna, No. 54, Bureau of Biological Survey, U. S. Department of Agriculture, 1935, p. 6.

lar types. In the more remote sections catches of rainbow trout weighing 12 pounds or more are common.

The fisherman will find in the larger centers of population excellent stores to supply him with tackle and equipment suitable for local requirements. Transportation facilities and guides are also available in such centers.

Migratory Waterfowl

Migratory waterfowl are also abundant in Alaska. The nesting areas there are excellent, because they are well watered and are in isolated districts. These centers have become of increasing importance as a source of replenishment for the bird supply in certain large areas of the United States.

The subject of wildlife in Alaska and the measures necessary for its protection are discussed at length in the staff report dealing with Wildlife Resources.

Forests

Alaska's forests fall into two groups: (1) those in the interior, embracing some 100,000 to 125,000 square miles consisting of a mixture of white spruce and Alaska white birch with black spruce in the moisture places, locally used for fuel and construction purposes, but of no export value; and (2) those of the coast forest region where the lower areas carry good stands of commercial Sitka spruce, hemlock, and Alaska cedar.

The best of the timber is embraced within two national forests—the Tongass in southeastern Alaska and the Chugach in the Prince William Sound Region—which together aggregate some 33,353 square miles or about 6 percent of the Territory's total area. The combined forests have a timber stand estimated at 84 billion board feet.

Forests constitute an important element in any recreational scheme. This is particularly true in the case of Alaska's coastal forests. While national forest lands are managed primarily for continuous timber production, their concomitant use for recreational purposes is encouraged, and is of far reaching importance.⁹

The Tongass and Chugach National Forests, especially the former, are destined to play an important part in the Territory's industrial development. Because of their location, size, scenery, abundant water resources, and wildlife, and use for recreational purposes, they loom large in any inventory of Alaska's recreational assets.

The Tongass National Forest embraces 73 percent of southeastern Alaska, which is the most accessible and populous part of the Territory. Possibilities for agricultural development in this area are limited.

Hunting under certain regulations is permitted in this national forest, as also in the Chugach. Admiralty Island, one of the main islands within the Tongass National Forest, is administered under a game management policy designed to provide special protection for the big brown bears.

Existing Areas—Recreational Facilities and Their Possible Development—National Parks and National Monuments

Facilities and Possibilities

There are five units of the national park system in Alaska. One of them, Mount McKinley National Park, is being developed at the present time. Another, Sitka National Monument, is reached by automobile road. Necessary restoration of certain historical features has been given attention. The three other areas—Katmai, Old Kasaan, and Glacier Bay National Monuments—are in reserve status, since funds are not available at the present time for their limited development. The total area of the five units is 5,801,978 acres. A brief description of each follows:

Mount McKinley National Park

Mount McKinley National Park was established by act of Congress approved February 26, 1917 (39 Stat. 938). Its area is 1,939,493 acres.

The park includes a little over 100 miles of the Alaska range; the crest of the dominating range of mountains is under perpetual snow. Mount McKinley is about one-third the distance from the western boundary of the park. The southern boundary is an arbitrary line along the southern slope of the range, probably located for the purpose of including the crest within the park boundary. No study has ever been made of the possibilities of developing recreational values south of the Alaska Range, since the present park boundary follows very closely the perpetual snow line. All ground to the south of the range, suitable for park purposes, is outside of the boundary.

The present park area is confined to the north slope of the Alaska Range. The Alaska Railroad follows the Nenana River along the eastern boundary, and access to the park is from McKinley Park Station. Within the park a road extends westward from McKinley Park Station along the tundra slopes to the north of the range. It crosses several rivers and makes its destination a point on the northern boundary near Wonder Lake. This road is 90 miles long. It affords splendid views of the Alaska Range and extends deep enough into the park to permit splendid views of Mount McKinley. The road was made passable to Wonder Lake during the summer of 1936. This one principal road, with possibly a few secondary short spurs, completes

⁹ See a later part of this staff report dealing with national forests.

the road needs of the park as now constituted. Future construction will consist largely in improvements.

The completion of this road makes possible a reorganization of the tourist facilities within the park. At present there is a tent camp at Savage River, 12 miles from the McKinley Park Station. This has served as a base for all tourist business while the road has been under construction.

A new hotel is now under construction at McKinley Park Station and will open for business sometime during the latter part of the 1938 season. This hotel makes it possible to move the overnight railroad stop from Curry to McKinley Park Station, and will serve the combined purpose of handling the railroad traffic and form the base for tourist traffic within the park. The next logical step in the development of tourist facilities will be the construction of a lodge or hotel well out in the park. A site near Wonder Lake has

been tentatively selected for this purpose. This will mean the abandonment of the present temporary camp at Savage River, and the two tourist centers will be at McKinley Park Station and at Wonder Lake. These two units are all that will be needed for some time. They will serve the visitors who see the park by motor vehicle and have but a limited time. They will also form the base for pack trips and mountain climbing expeditions for those who can remain in the park for longer periods.

Practically all traffic to the park must come to the McKinley Park Station by the Alaska Railroad. At some future date a connecting highway may be built between the park road system and the Richardson Highway. The construction of such a connecting link will undoubtedly stimulate traffic to the park. A recommendation that this approach highway be constructed is made in this report. These future demands



FIGURE 31.—Mt. McKinley—20,300 feet high

THE ALASKA RAILROAD

can be met by an increase in the size and variety of the tourist facilities at McKinley Park Station and at Wonder Lake.

Next to the scenic values of Mount McKinley and the Alaska Range, wildlife observation forms the most important recreational possibility in the park. All national park areas are game sanctuaries. Hunting is not permitted, nor any practices destructive of wildlife resources. Mountain sheep, moose, brown bear, caribou, and many other animals may be seen; also a wide range of bird species find sanctuary in the park at various seasons of the year. Wildlife is found in quantity and under conditions beyond comparison with possibilities for wildlife observation within the continental United States.

Mountain climbing and camping are encouraged during the park season. Fishing is limited as is the case in all areas of glacial streams.

Winter sports demand both accessibility and population. These conditions make the development of winter sports within the park unimportant at the present time.

A 6-year development program for Mount McKinley National Park, covering the fiscal years 1939 to 1944, inclusive, calls for a total estimated expenditure of \$568,250. This money should be sufficient for construction of a museum, hospital, shops, employees' residences, range stations, trails, and highway improvement in keeping with general increase in activities.

During the 1936 travel year, 1,073 people visited the park, and during the past year, 1,378 were recorded.

Katmai National Monument

Katmai National Monument was established September 24, 1918 (40 Stat. 1844). It includes the Valley of Ten Thousand Smokes and many other striking features, produced by the tremendous explosion of Mount Katmai in 1912.

The monument is 2,697,590 acres in extent. Due to its remoteness only specially equipped parties visit it at the present time. No record of travel is kept.

The surrounding region contains beautiful lakes and mountain scenery, waterfowl and fish in abundance, as well as the Alaska brown bear, or "Kodiak" bears, as they are commonly called.

This monument is practically inaccessible to any but the hardest mountaineers at present. Improvement of Amalik Bay Harbor, and the construction of a 30-mile trail inland would enable explorers and tourists to enjoy this unusual scenery and phenomena.¹⁰

Sitka National Monument

Sitka National Monument, an area of 57 acres, was established March 23, 1910 (36 Stat. 2601), and contains 16 totem poles of the finest native workmanship.

The area is notable for its Russian and Indian historical associations. It is heavily forested. It was the scene of a massacre of Russians by Indians in 1802. The graves of a number of Russians killed during the Battle of Alaska in 1804 are here. The Department of the Interior, through the Alaska Road Commission and in cooperation with the Alaska Historical Association and the Sitka Chamber of Commerce, has restored the old blockhouse used by the Russians in the Battle of Alaska.

The monument is located 1 mile by road from the town of Sitka, a port of call for steamers from Seattle and other seaports. Visitors to this monument during 1936 numbered 6,700; and during 1937, 4,500.

No additional development within the monument is contemplated for the immediate future, although it will be necessary to improve facilities as larger numbers of people visit the area. The National Park Service has a custodian, located in Sitka, in charge of the monument.

Old Kasaan National Monument

Established October 25, 1916 (39 Stat. 1812), this monument is 38 acres in extent and is located on the eastern side of Prince of Wales Island, about 50 miles from Ketchikan. The monument is held in reserve status since it is rather inaccessible. No figures on travel to the area are kept since it is visited very infrequently. At present there are no plans for development of the monument, although tentative plans do call for archeological excavations. The Alaska Road Commission has local charge of the monument for the National Park Service.

Glacier Bay National Monument

This area, established February 25, 1925 (43 Stat. 1988), contains great tidewater glaciers and affords an ideal field for ecological study. The monument covers an area of 1,164,800 acres and was set aside through the efforts of the Ecological Society of America with the endorsement of the National Geographic Society.

The monument presents a unique opportunity to understand glacial action and resulting movements and development of flora and fauna. It contains highly interesting relics of ancient interglacial forests, and a wide variety of vegetative covering and wildlife. The area is of considerable historic interest through records of explorers, many of them scientists, who have visited the region since the early voyage of Vancouver in 1794.

No administrative organization has been established in this area by the National Park Service. It can be made relatively easy of access for tourist boats, however, and since it is a highly important scenic and educational area the National Park Service is planning its limited development. Such facilities should be restricted so that the greater part of the monument or

¹⁰ Annual report of the Governor of Alaska, 1936, U. S. Department of the Interior, p. 8.

proposed national park may continue to serve as a superlative example of wilderness.

In 1936 Congress authorized, under regulations prescribed by the Secretary of the Interior, mining within this area. Visitors may find some recreational value in observing mining operations, which may be seen in many places in Alaska, but the intent of the law under which national parks and national monuments are established does not anticipate development other than that absolutely essential to enjoyment of these areas in their primitive, untouched form. Any extensive violation of this policy will certainly result in serious subversion of park and monument values, with a corresponding decrease in recreational enjoyment.

National Forests

There are two national forests in Alaska, namely, the Tongass and the Chugach. Their location is shown in figure 29.

The Tongass National Forest is located along the coast from the southern end at Dixon Entrance northward to White Pass and Glacier Bay. It includes practically all of the islands along the inland passage as well as the strip of mainland west of the Canadian boundary. The forest embraces 16,547,673 acres. It was established on September 10, 1907.

The Chugach National Forest also lies along the coast and is to the north of the Tongass. It extends along the coast from Cape Suckling westward to Seward and in addition covers the east half of Kenai Peninsula. It includes most of the islands along the section of coast line mentioned above as well as the Afognak Island which lies a considerable distance to the south and west of the main forest. It contains 4,798,548 acres and was established on July 23, 1907.

Both the Tongass and Chugach National Forests are characterized by rugged fiords which reach back into glaciers and by superlative mountain scenery. Along the coast are many magnificent forests of hemlock, spruce, and other species. Some of the trees reach a size of 8 feet in diameter breast height, although in general the maximum size is considerably smaller than this. A dense undergrowth and a heavy precipitation make forest travel here exceedingly difficult except in those unusual places where trails have been cut. Many of the forests are mature and defective, which to some people makes them appear unattractive and to others gives an impression of extraordinary beauty. The same difference of attitude is also found toward the beauty of the dense undergrowth found in this region of high precipitation.

There are very few roads or trails anywhere in these forests except in the extreme western portion of the Chugach National Forest on the Kenai Peninsula

where a number of good gravel highways have been built. The total mileage of roads in the forest highway system is 240. There are also 33 miles of minor roads and 884 miles of trails.

There is at present little touring in the national forests. The lack of trails makes it too difficult to "buck" the brush found on such forests, while the lack of road connections with any main road system and the few roads in these national forests make automobiling of little importance. However, to some people the absence of roads and trails and the relatively few people who visit these forests give them a special value as the last great area on national forests for true wilderness enjoyment.

During the travel year 1937 campers in the two national forest numbered 9,200; picnickers, 14,000; and hikers and others who came to enjoy the scenery, about 28,000. There were also some 14,500 who passed through the forests.

The distance of these forests from the continental United States and the consequent cost of reaching them, plus the expense of outfitting for a trip into those truly wild areas, results in a very limited recreational hunting and fishing. The Alaska brown bear, largest of all North American wildlife, is probably hunted more on these two forests than anywhere else. The great trophy value attached to this species has led game administrators to initiate a program for the maintenance of the brown bear population.

Practically all people who tour in Alaska, unless they are traveling on yachts or on the vessels of the commercial steamship companies, and all people who go hunting and fishing, must camp in the process of enjoying these forms of outdoor recreation. There is, however, very little camping merely for the sake of camping such as is found in the national forests of the continental United States.

Picnicking is done on some of the forest lands in the immediate vicinity of such of the larger towns as Juneau, Ketchikan, Petersburg, Cordova, Valdez, Seward, Douglas, and Sitka.

There are innumerable jagged high peaks throughout the Tongass and Chugach National Forests, the great majority of which have never been climbed. Though at present they attract few mountain climbers, they are a valuable buttress against that day when all mountains in the continental United States will have been conquered.

Winter sports are actively followed by the local residents but the population is quite small. Alaska winter sports have so far not attracted visitors from outside the Territory as travel costs from the continental United States are too great and similar sports are frequently available closer home.

Program for Development

National forests are operated on the principle of multiple use. No one type of forest activity dominates their development. It is true that certain limited areas are at times devoted exclusively to one use. On the other hand, in general, several different uses take place on the same area. In the development of the Alaska national forests certain areas will be set aside primarily or exclusively for recreation. However, the Forest Service has not yet had sufficient opportunity to make a survey of recreational possibilities in Alaska. Because of the present limited use, there is also difficulty in predicting the localities and the type of recreation that will become most important. The Forest Service will take special precautions, even where commercial use is being made of the forests, to protect the scenery along the principal steamship routes. Present lumbering is relatively unimportant, but certain areas will sometime have extensive timber cutting on a sustained yield basis. So rapid is the growth of timber in Alaska that many of the cut-over areas should soon carry vigorous young stands which will be very attractive, even if they will not have the impressive size of the virgin trees. However, there will also be certain virgin forests kept free from cutting and a very considerable expanse of fiord and mountain area will be dedicated primarily to recreational use.

It is planned gradually to develop the trail system on the national forests of Alaska so that they will be more accessible.

Because of the limited use and the vast amount of area potentially available to camping, formal camp sites will not ordinarily be developed except in the limited areas penetrated by highways leading out of the towns. In general, the huge size of the Alaska forests and the small use to which they are put make them especially favorable sites for genuine primitive recreation where people can still go out to travel and camp in a pioneer fashion.

Wildlife Refuges

Game reserves and wildlife refuges in Alaska are naturally of great recreational importance for the reason that they are established to protect and perpetuate wildlife, and wildlife observation and hunting in the Territory are among the principal recreational pursuits of residents and visitors.

Development of a game refuge system in Alaska started in 1892 with the establishment of Afognak Island Reservation. Since that time 11 other refuges have been established. The one national park and four national monuments within the Territory also operate as game reserves, since no hunting is allowed in them. In addition, there are 36 areas that do not have game

refuge status, but in some of which all wildlife is continuously protected from hunting, while in the others certain species are continuously protected.

A study of regulations in Alaska relating to game and fur animals and birds shows that the entire Territory has been carefully zoned into administrative game districts based upon study and experience of the Alaska Game Commission, which is vitally interested in conservation of game resources for recreational purposes.

Problems and Recommendations

An attempt has been made in the foregoing to describe the extent and character of Alaska's recreational resources, to list the facilities found in existing recreational areas, and to point out the possibilities of those areas for further development commensurate with increased requirements.

In order that greater use of recreational resources in Alaska may be facilitated in the most practicable manner, the most significant steps in basic development, according to logical priority, should, of course, be given first consideration. As a part of a sound recreational program there is presented in the following pages a review of the most important problems, together with recommendations in connection therewith, which are offered to serve as the basis for a broad recreational plan for Alaska. The recommendations cover: (1) The establishment of a Federal Planning Authority for Alaska to formulate an integrated policy for the conservation and development of all public lands, including those suitable for recreation; (2) provision for more adequate transportation and other tourist accommodations; (3) enlargement of the existing recreational area system; (4) provision for adequate protection of the existing recreational area system, and the general conservation of natural resources.

Recreation as Part of an

Integrated Conservation Program

With only about 1 percent of its lands privately owned, Alaska offers an unusual field for planned use along conservation lines to produce maximum returns on a sustained-yield basis.

Alaska offers a challenge to avoid the mistakes that arose from the hurried development of the West, such as conditions typified by the great "dust bowl," the farming of submarginal lands, the pollution of streams, the destruction of forests, and the lack of planning for present and future recreational needs, causing the Federal, State, and local governments to purchase at high prices lands to meet the present and future recreational requirements.

The avoidance of such mistakes in the case of Alaska should be a comparatively easy matter. Americans

have become too conservation minded to countenance a repetition of the practices destructive of land resources which prevailed in the past in certain parts of the United States. They will readily support movements which make for the protection and planned use of the Territory's resources.

Among these resources, those of a recreational value are outstanding. They are the basis of a tourist trade which is a very important part of the Territory's economic life and is destined to become of even greater importance as needed hotel accommodations and transportation facilities are provided. The growth of population in the United States, the increasing amount of leisure time at the disposal of the public, and the growing recognition of the need and value of recreation will further tend to increase the number of visitors to the Territory.

In planning the use of these resources we are confronted with the need of providing for further requirements in excess of those existing at present. That involves not only consideration of the probable growth of Alaska's population but also of the extent to which vacationists from the continental United States will journey to the North. There are, however, too many unknown factors to predict the future use of the Territory's recreational resources and facilities. This question in turn involves consideration of how the present resources can be conserved and possibly enhanced to meet these greater needs.

Because of the importance of the recreational use of lands and its contribution to the present and future economic well-being of Alaska, recreation should be regarded as one of the elements which collectively should be considered in planning the future development of Alaska. Therefore it is recommended that questions relating to recreation needs and facilities be made part of an integrated Federal program which has for its aim the coordinated development, under sound conservation policies, of Alaska's possibilities in the way of industry, mining, farming, and other phases.

To expedite further and to assure sound planning for the recreational as well as all related phases of Alaska's development, it appears wise to establish a special planning authority for Alaska which will develop a program in the same manner as will be performed by the seven regional planning authorities proposed for the continental United States in bills now pending before Congress. As the Territory is so largely in Federal ownership, it is also recommended that Federal officials constitute the majority of the membership of such a planning authority.

It is further recommended that such a planning body consider recreational resources and facilities, not only in terms of Alaska's present and future needs but also

as a part of the recreational system of the continental United States.

If this Alaska planning authority is established, it would be wise to have this agency divide the Territory into geographic units, such as Fairbanks, Kenai Peninsula, etc., and then give priority to those districts where population is concentrated. Under this system each district would be studied in detail by experts on agriculture, mining, fishing, forestry, transportation, recreation, etc., and an integrated program agreed upon to guide the wisest use of land.

Such a planning authority could designate, for instance, certain areas within those districts for intensive agricultural development, and yet define their limits so they would not jeopardize big game or hunting. Certain tracts of little industrial value and yet of outstanding scenic or recreational worth, could be earmarked for future recreational uses and as game sanctuaries. Roads could be planned that would be in keeping with the planned development of the various areas. The locations and types of hotels could be determined in advance so that they would be close to possible centers of population and points of interest, and at the same time, accessible to tourist routes.

The work of the suggested Alaska Planning Authority in coordinating future recreational requirements as part of an integrated plan would be considerably facilitated by having available the results of the recreational study for Alaska, the purposes of which have already been outlined. That study would include an analysis and appraisal of recommendations for meeting the present and future recreational requirements. It is recommended that funds be made available for completing at an early date the recreational study in Alaska.

Provision for Adequate Transportation and Other Tourist Accommodations

There is every reason to believe that tourist business in Alaska can be increased immediately and to a great extent through the establishment of improved boat, rail, and hotel facilities. The existing inadequate scale of operations among these three interdependent services is one of the principal factors limiting travel to Alaska today. It is imperative that the three be improved simultaneously. If this is not done, the public cannot be provided with the attractive and dependable complete service it must have if patronage is to increase. Also, no one or two of the three can afford to take the lead and await improvement of the third.

There is general agreement that hotel accommodations and transportation facilities in Alaska are inadequate for even the present volume of tourist traffic. During the summer of 1937, for instance, steamship reservations were at a premium. Bookings had to be

made well in advance. The limited facilities available not only served to curtail the number of tourists, but also militated against their free movement. If a tourist departed from his itinerary, he could not be sure that he could find accommodations on the next boat. This situation should be corrected by the improvement of the transportation facilities if gains in the volume of the tourist traffic are to be expected.

It is, therefore, recommended that the Federal Government, through the proper planning authority, assist in solving this problem by: (1) Leasing at a nominal rent sites in the public domain to private hotel and steamship companies for the purpose of constructing hotels and providing additional facilities for the tourist traffic; (2) considering in the establishment of new areas, or the extension of those already existing, so far as is consistent with the purposes for which the areas are established, means of encouraging private interests to undertake the construction of new and additional tourist facilities; (3) encouraging steamship companies and local private agencies, either singly or jointly, to finance the construction of new and additional hotel and transportation accommodations, and (4) providing the Alaska Railroad with such new equipment as may be necessary in line with improvement of steamship and hotel accommodations.

Improvement of Territorial Highway System From the Standpoint of Recreation

Whenever steamship, hotel, and railroad accommodations are so improved that a larger order of tourist business is realized, one of the first accompanying problems stressed will be that of refining the Territorial highway system. This should be held within reasonable limits according to priorities set forth by the proper planning authority, since it is foreseen that to overextend highway development, even in plan, might jeopardize the primary need for improvement of steamships, hotel, and rail facilities. Existing major highways of the Territory should be improved, and, of course, this improvement should include greater coordination with other transportation facilities. New highway construction in the Territory, so far as recreation is concerned, should be undertaken where the greatest potential tourist trade to the Territory will result, but never where it will seriously interfere with important recreational or other resources.

Construction of Approach Road to Mount McKinley National Park

There is no way of approaching the Mount McKinley National Park by highway. The Alaska Railroad is practically the only means of transportation. There are, however, two landing fields in the park.

At present there are three ways of traveling to the park from continental United States. The most popular is to travel by boat to Seward and then by the Alaska Railroad to the park entrance. Another is via the Richardson Highway from Valdez to Fairbanks and thence via railroad to the park station. The third way is to take the boat to Skagway, the railroad over Whitehorse Pass, then down the Yukon to Tanana, and up the Tanana River to Fairbanks and to the park by train.

A connecting road between Paxsons, on the Richardson Highway, and the park entrance was suggested in 1936 by the Alaska Road Commission. Emphasis was laid upon this new highway as an aid and an inducement to tourist travel. It would enable visitors to motor all the way to the park from the time they leave the boat at Valdez, where the Richardson Highway begins, and then at Paxsons follow the proposed new road to Valdez Creek, to Cantwell, and into the park. Some 155 miles of new road are involved, most of which traverse a well-known mineral belt.

It is recommended that this approach road be constructed.

Proposed International Highway

The construction of an international highway connecting the northwestern part of the United States with British Columbia, Yukon Territory, and Alaska would, according to its proponents, greatly stimulate the Territory's development and tourist trade. Its advocates emphasize that the resulting benefits from the American point of view would be many. As a link with the vast continental road system of the United States, it would add greatly to the welfare of Alaskans. They also point out that it would provide a means of joining the Richardson and Steese Highways in central Alaska with the continental highway system and make that area more accessible for recreational and industrial purposes. Its construction would result in a reduction in the cost and time involved in making a trip from the Pacific Northwest to Alaska under present circumstances. These savings, it is pointed out, would make it possible for greater numbers of Americans living on the mainland to vacation in Alaska.

The proposed "highway is a feasible project," according to the Special Commissioners, appointed by the President, pursuant to the act of Congress, approved May 15, 1930 (Public, No. 228, 71st Cong.), to cooperate with representatives of Canada in a study regarding the construction of this international highway with a view of ascertaining whether such a project was feasible and economically practicable. Their subsequent report, published in 1933, entitled "Report of the Commission to Study the Proposed Highway to Alaska," the Depart-

ment of State, Conference Series No. 14, is a study of the project, based on a number of ground and airplane reconnaissance surveys over the unimproved sections of the route.

The road proposed would begin at Seattle, Wash., and end at Fairbanks, Alaska, and be some 2,256 miles long. It would involve the construction of 1,183 miles of new road: 520 from Hazelton in British Columbia to Yukon boundary, 480 in Yukon Territory, and 183 in Alaska.

Two general routes are suggested for the northern end of the highway: (1) The Dawson-Fairbanks route, with its service to Yukon Territory, and the Forty-Mile and Chicken Creek mining areas in Alaska; and (2) the White Horse-Kluane Lake Gulkana-Fairbanks route, which involves less new road construction, saves hundreds of miles of new construction, and also serves important American mining territory.

On August 26, 1935, Congress authorized the President (Public, No. 345) through such channels as he might deem proper, to negotiate with the Canadian Government for the survey, location, and construction of the highway. These negotiations are still in progress (November 1937).

According to the Special Commissioners, one of the chief economic gains to Alaska from the construction of the highway would be the increased business resulting from an enlarged tourist traffic. As they point out: "This business will flow directly from the expenditures of visitors for living expenses, gas, oil, garage charges, and miscellaneous purchases of articles or services."¹¹

While they are unable to estimate the resulting gains in the number of tourists, they do present estimates as to the number of cars using the highway and the expenditures by such visitors. The figures cited below "show the amount of business each year that may be expected to flow directly from tourist travel only on the proposed route. It is considered to be a very conservative statement and it takes into account none of the various returns that the route may be expected to produce in other ways."¹²

Alaskan trips

Year	Number of cars	Expenditures by tourists	Earnings through taxes
1.....	3,100	\$1,860,000	\$102,300
2.....	3,300	1,980,000	108,900
3.....	3,500	2,100,000	115,500
4.....	3,750	2,250,000	123,750
5.....	3,950	2,370,000	130,350

By some, however, it is contended that the highway would not be in the best interests of conserving the Territory's recreational resources. They fear that the

road will be destructive of that quality which is unique and at the same time forms the basis of Alaska's appeal to tourists—its primeval aspects against a frontier background.

With reference to the proposed highway, Robert Marshall, one of the members of the group which prepared this staff report, points out:

1. The greatest recreational value in Alaska is not its scenery but its frontier aspect. Building a road from the United States to Fairbanks would destroy this frontier characteristic. Automobile roads and the frontier are incompatible.

2. This highway would cater primarily to the interests of the higher income groups, because relatively few American citizens could afford to travel the several thousand miles by car necessary to enjoy a vacation in the far north. If the Government does invest money in order to help American citizens to get to the recreation areas more easily, it should do so primarily in the interests of the low-income majority of its citizens, who can only afford to visit areas much closer home.

3. A road to Fairbanks would have far-reaching effects on the whole social and economic life of Alaska. It would bring to Alaska many of the people who now drift from one region of seasonal occupation to another in search of work. Such an invasion would entirely upset the present wage structure in Alaska and would have a major bearing on the type of life which the people live in this isolated territory.

4. An international highway will bring an increase in hunters, trappers, and miscellaneous game slaughterers, which may result in a serious upset to the biological balance and a dangerous diminution of the wildlife with which the whole culture of northern Alaska is integrated.

5. An international highway would bring to Alaska a greatly increased number of forest fires. There is some possibility of controlling forest fires in Alaska, even with the small amount of funds available for protection, if there is a fairly stable population. If, however, the country is thrown open to migrants, the forest fire danger in the highly inflammable interior country may well get completely out of control.

The construction of the highway would undoubtedly alter frontier conditions. A certain amount of danger to the existing primitive conditions would be presented by an influx of a floating population, by depredations upon wildlife, and by an increased number of forest fires. Proper safeguards, therefore, must be established to ward off such dangers.

As this highway would have far-reaching effects upon the future use and development of the Territory's recreational resources and facilities, and because it raises in that connection a number of complicated questions requiring careful study, it is, therefore, recommended that a comprehensive study be made of the relation of the international highway to the question of recreation, particularly as it bears upon the conservation of resources and its effects upon future requirements. Should the highway be constructed, it is suggested that the Canadian Provincial Governments and the Federal Government give consideration to measures looking towards preserving and protecting the scenic aspects along the highway, and to that end they consider the

¹¹ Report of the Commission to Study the Proposed Highway to Alaska, The Department of State, Conference Series No. 14, 1933, p. 34.

¹² *Ibid.*, p. 38.

question of promulgating zoning regulations and the securing of wide rights of way and scenic easements wherever necessary.

Protection and Preservation of Historic and Archeological Sites

Because of their strategic location on the probable route of migration to the North American continent, Alaskan historic and archeological sites possess a peculiar importance which makes their preservation from idle destruction and their scientific study a matter of national concern. Accordingly, any comprehensive plan for the conservation and development of the recreational resources of Alaska should, from its beginning, make adequate provision in the historical and archeological field.

Since Alaska became a part of the United States 70 years ago there has been no serious or concerted effort in this direction because of the lack of funds and personnel. Meanwhile destruction through undirected interest and mercenary exploitation has consistently increased. A report prepared in 1934 by a committee of nationally recognized archeologists, working under the auspices of the National Resources Board, revealed that Alaska contains at least 21 sites of first rate scientific importance at present lacking any effective protection.

The seriousness of the situation is described in the following statement by Henry B. Collins, Jr., assistant curator of ethnology, National Museum, whose years of archeological field work in Alaska make him an authority in these matters:

In Alaska the problem of the preservation of archeological sites is somewhat different from that encountered in other parts of the country. Here instead of the commercial pot hunter, who digs to obtain "relics" for sale, it is the Eskimos themselves who are responsible for the destruction. There are very few old Eskimo sites of any importance that have escaped; the Eskimos are busily engaged in digging them for ivory, from which to make paper knives, beads, and other objects for sale to tourists and local residents. Such activity would be unheard of in Canada or Greenland, where prehistoric sites are rigorously protected and unauthorized excavation prohibited, yet it is a tragic paradox that in Alaska, where there are far older and more important sites—in fact, the oldest thus far known from the American Arctic—the laissez-faire system still operates, and anyone, Eskimo or white, is free to dig as he pleases.

Among the unprotected areas is Cape Prince Wales where the American mainland most closely approaches Asia. Assuming that man entered America in post-glacial times after the subsidence of the land bridge, this is in all likelihood the exact spot where he landed. All but 3 of the 21 sites are located on Federal land where prompt action can result in permanent preservation. These sites were designated A, B, and C in accordance with their apparent scientific and historical importance. A summary of these sites, and a tabula-

tion of the results of the inventory prepared in 1934 can be furnished by the National Park Service upon request.

It is fortunate that sufficient legal authority exists in the American Antiquities Act (June 8, 1906, 34 Stat. 225) and the Historic Sites Act (August 21, 1935, 49 Stat. 666), to permit taking the most important steps to conserve these invaluable remains and develop selected sites for public use. Present information indicates that some, if not all, of the "A" sites listed in the inventory of 1934, should be definitely set aside as national monuments or national archeological sites and be protected by improved enforcement of existing laws. What is needed immediately is a series of detailed studies upon which recommendations can be based.

Not all sites which should be conserved can be developed as part of a recreational program, but among them are selected areas which probably have great public appeal, as well as educational value for the tourist. Prehistoric house sites, kitchen-middens, mounds and caves, native Indian villages and historic sites of Russian and American origin, collectively present an invaluable picture of the Territory's history and prehistory and form an important element in any coordinated plan for the development of Alaska's recreational resources.

The possibilities in this direction are indicated by a recent report on Sitka National Monument, one of the two historic and archeological sites so far set aside in Alaska. At present the monument area of 57 acres embraces the decisive battlefield of the Russian conquest of Alaska in 1804. It is in close proximity to the city of Sitka, which has been an occupied site since prehistoric times. No part of the Territory is richer in Russian associations. The present town, established in 1804, was the chief factory of the great Russian-American Fur Co. and became the center of a type of Russian colonial life, unique on the North American continent. It is of more than ordinary interest to realize that a considerable number of Sitka structures from the early days survive: The Cathedral of St. Michael, built in 1848; the Russian school building; the Blarney stone where Baranoff often sat; and the foundations of the piers the Russians built, still visible under wharves at which modern ships dock. The road around Sitka was built in the early days by the Russians to procure water.

A program for the preservation of Sitka might well be considered, including the following steps:

1. An immediate survey of the situation, with the help of recognized authorities on Alaska history;
2. Plans for stopping the further destruction of old buildings, including the preservation of all surviving structures;
3. Consideration for restoration of as much of the colony as might appear desirable to convey an accurate impression of its colonial character at its high point, about 1825.

It is also suggested that consideration should be given to the authentic preservation and restoration of typical Indian villages, such for instance as those of the Haida and Tlingit tribes in southeastern Alaska. Emphasis should be placed upon the historical accuracy of such work. The community buildings, for instance, could be reconstructed by the methods originally used by the Indians. Indians are available for this work and to carve the necessary totem poles if they cannot be obtained from deserted villages.

While these subjects are cited here solely as illustrations of what might be done, it should be pointed out that Federal responsibility for such conservation and development work has been clearly recognized by Congress in its statutory declaration of August 21, 1935 (49 Stat. 666), "That it is hereby declared that it is a national policy to preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States."

Enough is known about Alaska at present to say that historical and archeological resources of unquestionable importance exist there; that they are in need of immediate conservation measures; and that some offer attractive possibilities for educational and recreational development. Further study is needed, however, before a detailed program can be submitted.

As an immediate measure, it is recommended that Historic Sites Survey of the National Park Service make detailed studies looking toward a proposed historic and archeological program for the Territory, and to take the necessary steps to bring the most important sites now on Federal land into the National Park System for protection and educational development.

Establishment of Wilderness Areas

Since the unique recreational value of Alaska is its frontier character, it is obvious that an important objective of recreational planning for the Territory should be to preserve so far as possible wilderness conditions. Such planning might seem superfluous to some because such a large part of Alaska still remains in its original state. However, one need only recall that two generations ago the greater part of the western United States was still a wilderness to realize how rapidly the primitive fades away once development commences. Wilderness conditions do not automatically preserve themselves.

Because of this fact, it is recommended that parts of Alaska should be specifically designated as areas to be kept free from automobile roads. In size such roadless areas should be materially larger than any wilderness tracts in the continental United States, of which the largest do not exceed two million acres.

There is also need for special planning to preserve areas along the Alaska coast, which, because of their accessibility by boat, might lose much of their primitive quality by the invasion of large masses of people. Such areas will probably have to be smaller in size than those above designated. It is therefore recommended that a number of tracts along the Alaska coast be set aside as areas to be kept so far as possible in their primitive state by closing them to roads, hotels, and private homes. In this way they will fit the needs of that ever-increasing number of Americans seeking the joys of leisurely and quiet contact with nature.

Proposed Glacier Bay National Park

The extension of the present Glacier Bay National Monument was first proposed in 1927 by the then Chief of the Bureau of Biological Survey as a means of providing a suitable wildlife refuge for the Alaska brown bear.

The chief reasons that the present monument be increased in size are: (1) It will make a suitable reserve for the brown bear; (2) it will include some of the finest scenery in all Alaska, and (3) it will preserve intact a suitable section of the coast forest of Alaska, including the finest extensive stand of Sitka spruce in the Territory. These features, when combined with the glaciers and the unique exhibit of plant and animal life found in the present monument, qualify the enlarged area in the opinion of the National Park Service, as a national park. That Service is now proposing such a designation.

That the enlarged monument would be an outstanding tourist attraction was emphasized by the special Senate Committee on Conservation of Wild Life Resources, which on page 10 of its report, rendered pursuant to S. Res. 246 (72d Cong., 1st sess.), 1931, stated:

Alaska National Park.—It is strongly recommended that the Director of the National Parks be requested to make a thorough study of Glacier Bay, and its vicinity, now a national monument, with the idea of adding to the national monument some of the forest area along the gulf coast and to the south and to the southeast, perhaps as far as the Lynn Canal westward to Mount St. Elias, which would protect a certain number of large brown bears, and be, as far as scenic wonders are concerned, the most magnificent of all the national parks. It is comparatively accessible to tourists, as it is less than 100 miles from Juneau, and can be reached through an Inland Sea on smooth water and by small boats. * * *

The enlarged boundaries now proposed by the National Park Service are less than those suggested by the Special Senate Committee on Conservation of Wild Life Resources.

Roughly, the limits of the proposed extension would extend on the northwest from the summit of Mount Fairweather which is on the International Boundary line, and also on the northwestern boundary of the

present monument; and thence westward along the north bank of Sea Otter Creek from its headwaters to the Pacific Ocean; thence southeasterly following the coast to Cape Spencer; thence northeasterly through Cross Sound and Icy Strait north of the Inian, Lemesurier, and Pleasant Islands to Excursion Inlet, and excluding the surveyed lands in fractional townships, T. 39 and 40 South, Ranges 58 and 59 East; thence northerly along the west side of Excursion Inlet, to the head of that inlet; thence eastward to the crest of the hydrographic divide separating Excursion Inlet and Lynn Canal; and thence northwestward following the crest of said divide to its intersection with the boundary of the present Glacier Bay National Monument.

The proposed park would total some 2,339,840 acres, of which some 1,164,800 acres are within the present monument. The area of unreserved public domain to be included is approximately 460,800 acres and of national forest lands, some 712,240 acres. These boundaries have been discussed with officials of the Territorial Government and of the United States Forest Service, who have advocated that the existing monument be enlarged and established as a national park.

There are a few homesteads and private interests within the proposed park boundaries. It is believed that these conflicting interests can easily be adjusted. Recent legislation has authorized mining activities in the existing monument.

With limited development, the proposed park would attract thousands of visitors. As a means to that end, it is suggested that the Coast and Geodetic Survey chart the waters of Glacier Bay at an early date. A number of small docks and wharves should be built at different points in the Bay, enabling coastwise steamers to discharge passengers. A system of trails should be developed leading from tidewater to the glaciers, fishing streams, game areas, and other points of interest. A number of shelters and cabins should also be constructed. Provision should be made for adequate personnel to administer the area.

It is also suggested that the Territorial Government try to enlist private capital in constructing and maintaining small steamers which would serve as floating hotels. With Juneau as their base, these might specialize in tours of Glacier Bay and its vicinity.

Special care must be taken not to destroy the purposes for which the monument was originally established. These were to maintain it as an example of that complete series of forest developments from the first lichens appearing after the glaciers to the final climax, all unmodified by man.

Because this area has long been considered as a natural recreational unit, it is recommended that its establishment as a National Park be given early study.

Proposed International Park

The proposal has been made to establish an international park in the region north and west of Skagway. Such a park, it is suggested, might embrace territory lying along the International Boundary between the 141st and 135th meridians from salt water inland to the vicinity of Lake Kluane. The city of Skagway and the territory in its immediate vicinity would not be included within its boundaries.

The proposed park would include some of Alaska's finest scenery and glaciers. It would be comparatively close to a number of centers of population.

The proposal for the establishment of this international park is of such recent origin that sufficient time has not been available to make a thorough study of its advantages and disadvantages. It is recommended that careful study be made of its proposed boundaries before definite recommendations are formulated.

Establishment of Recreational and Game Management Units

The big game and general recreational potentialities of the national forests are very important resources. They can be made to contribute very substantially to the local economy through attraction of hunters and outdoor enthusiasts to the region.

The three large islands, grouped in the northern part of the Tongass National Forest, namely, Admiralty, Baranof, and Chichagof, are the only islands in southeastern Alaska which have the Alaska brown bear. They also have excellent fishing streams and lakes, as well as good populations of wild fauna and outstanding scenery. According to the Forest Service, these three islands have outstanding recreational potentialities which could be developed consistently with their other and primary uses.

The locality embracing the Unuk River, Walker Cove, Chickamin River, Rudyard Bay drainages, and the north end of Revillagigedo Island, also furnish exceptional opportunity for recreational development and use because of their magnificent fiords, high rugged mountains, grizzly bear, mountain goat, deer, and various other interesting fauna.

These two localities should be planned and administered to make available their recreational resources for the wisest possible use through special recreational rules and game regulations. A well-planned system of permanent improvements, including facilities for recreationists, such as trails, camps, and shelter cabins, hotels and headquarters for the administrative officers, should be planned and established.

Greater Care of the Public Domain

Because at the present time about 99 percent of Alaska is federally controlled, its conservation is of vital interest to the Federal Government.

Of all the forces at present threatening the public domain, the greatest is the depletion of the vegetative cover by man-caused fires. This far exceeds the combined results of all other agencies destructive of valuable land resources. Due to the lack of funds and fire-fighting personnel, fire is today the chief menace to wildlife, reindeer, stock raising, agricultural development, and to the maintenance of primitive areas in their original state for future recreational purposes. Except in the humid coast region, there is a large fire hazard. "The scant precipitation, the high proportion of daylight hours combined with warm weather in the summer months, and the occurrence of a continuous mat-like ground of vegetation constitute a high fire hazard. Not uncommonly a fire will rage for many weeks and extend over hundreds of square miles before being checked by natural barriers, such as rivers, or by the coming of the fall rains."¹³

The damage has apparently gone on since 1900 in almost every part of the section north of the Pacific coastal strip. It is estimated that between 1915 and 1935 some 20,000,000 acres have been burned over. Numerous fires have burned uncontrolled for long periods along main routes of travel. In the sub-Arctic region, with its slow growth, the recovery of the burned over areas is exceedingly slow.

Fires in Alaska are almost entirely due to man's negligence. Hunters, prospectors, wood cutters, and all classes of travelers frequently leave fires which result in extensive burns. "In fact, a majority of persons who travel, work, or live on the open range handle fire in a casual way that indicates a failure to realize that unrestrained burning is draining away a large part of the resources on which the Territory is dependent for its continued well-being."¹⁴

There has been, however, in recent years a growing consciousness in the Territory of the damage wrought by fire, due in part to the objections of tourists to the

smoke pall obscuring scenery and to smoke as a hindrance to airplane travel. The damage, however, is still so great that energetic measures should be started as soon as possible to reduce the losses to a minimum.

It is recommended that a comprehensive plan for fire protection and suppression be drawn up by the Department of the Interior. Such a plan should include an extensive educational program, which would involve the cooperation of the many Federal and Territorial agencies in Alaska. The plan should include estimates as to the cost of carrying out such a program and recommendations as to the funds and fire administration personnel necessary for adequate protection. Emphasis should be laid, however, upon the program of education because of the Territory's small population and the number of official agencies whose cooperation can be enlisted.

Development of Native Handicrafts

The tourist trade is a valuable outlet for the sale of Alaska's unique articles of native handicraft. Their production should be encouraged, as they form the basis of a local industry which makes for the greater economic independence of the Indians and Eskimos. It might be advisable, for instance, for the Office of Indian Affairs to designate one of its Alaska personnel to confine his activities to the greater development of these handicrafts.

Among some of the articles sold by the Indians to tourists are beautiful baskets made of spruce roots; yellow cedar chests, moth repellent, covered with totemic designs; small yellow cedar totem poles; blankets made of mountain goat hair, and moccasins of hair seal. Among articles made by the Eskimos are ornaments carved from walrus, fossilized ivory, and fossilized mastodon ivory.

* * * * *

In the above discussion and analysis of Alaska's recreational resources we have pointed out that their primitive or frontier character constitutes their distinctive quality. It is hoped that in all planning activities this factor will be emphasized and maintained.

¹³ Alaska from the Western Range—A Great but Neglected Natural Resource, U. S. Forest Service, Senate Document 199, Separate, No. 17, by B. F. Heintzleman, Principal Forester, 1936, p. 592.

¹⁴ *Ibid.*, p. 593.

MAPPING AND CHARTING¹

Any plans for stimulating the development of Alaska require almost immediately the use of maps or charts for the study of the problems involved, or for representing the suggested solutions. Maps or charts are inevitably necessary for air or water transportation to and from all parts of the country and for the adequate planning of roads, forest control, mineral resources developments, distribution of schools, post offices, population, and industries. For many of these special purposes the emphasis in the mapping lies in the proper representation of the facts relating to the special subject under consideration, rather than on the basic map on which these facts are shown. This basic map is generally either compiled or copied from original maps that have been made by organizations other than those responsible for the collection of the information on the special subject. There is thus a fundamental distinction to be drawn between maps or charts made for these special purposes and the general-purpose bases on which this special information is mapped. The scope and character of the investigation for which these special-purpose maps are made must necessarily be handled through the specialized organization skilled in such work and entrusted by law with the conduct of that type of investigation. It is readily apparent that, except for the general-purpose bases used in these special-purpose maps, a program for mapping or charting of this kind lies outside the field that may properly be considered by this report. The following discussion will be restricted to a consideration of general-purpose maps of the land areas and nautical and aeronautical charts. For the sake of brevity, in the succeeding pages of this report the term "map" will be used to denote solely the general-purpose maps of the land areas of Alaska, and the term "chart" to represent the water areas and the under-water features by sounding and depth curves, supplemented by such topographic features as may be of aid to the mariner.

Maps

The preparation of general-purpose base maps, for use in special-purpose or other studies, is an under-

taking that can only be effectively carried on by specialized mapping organizations, because in that way duplication is avoided, standards of accuracy are maintained, and a unified well-organized program found out. The making of such maps is an intricate procedure, every step of which involves the rigorous application of well-tested and approved methods by technical specialists. At the present time the Geological Survey is the principal Federal organization that is carrying on the surveys of the land areas for the construction of such general-purpose maps. The general continent-wide network of carefully determined geographic positions to which these individual surveys are tied, technically known as "First or second order control," is executed by the Coast and Geodetic Survey, in addition to its duties in the construction of charts, nautical and aeronautical.

The areas of the different types of surveys already executed by the Geological Survey for the general-purpose maps of Alaska are indicated in column 1 of the accompanying table.

Topographic mapping program for Alaska¹

	Total mapped by Geological Survey to Jan. 1, 1937	Adequate	To be revised	New	Total of columns 2, 3, 4	Percent
Column No.	1	2	3	4	5	6
Exploratory.....	85,446	14,297	-----	125,785	140,082	21.0
Reconnaissance.....	170,998	153,189	77,162	182,608	412,959	70.4
Detailed.....	4,295	4,295	23,064	6,000	33,359	5.6
Planimetric only....	11,270	-----	-----	-----	-----	-----
	272,009	171,781	100,226	314,393	586,400	100.0

¹ Figures in square miles.

Not all of the area already mapped and reported in column 1 has been surveyed on standards regarded as meeting present needs, so that for some of these areas revision or mapping with a higher degree of accuracy is required. The area of each type of mapping that is considered adequate to meet present-day requirements is shown in column 2. In column 3 is shown the extent of the areas that should be resurveyed more accurately. In the main, the need for these resurveys is not due to early faulty work, but rather to the need for mapping on larger scales; for instance, about 70,000 square miles of the area now mapped on exploratory scales should be remapped on reconnaissance scale. Column 4 shows the area under each standard that, in the light of present-day needs, might

¹ Prepared by a group composed of Dr. Philip S. Smith, Geological Survey; Capt. J. H. Hawley, Coast and Geodetic Survey; Capt. P. H. Timothy, Corps of Engineers; Major C. Y. Banfill, Army Air Corps; Lt. Comdr. E. F. Helmkamp, Navy Hydrographic Office; Carleton P. Barnes, Department of Agriculture; E. L. Yuravich and Charles P. Stanton, Bureau of Air Commerce; Thomas Riggs, International Boundary Commission, United States, Alaska and Canada; Lt. Comdr. Merlin O'Neill, Coast Guard; Thomas Havell, General Land Office. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

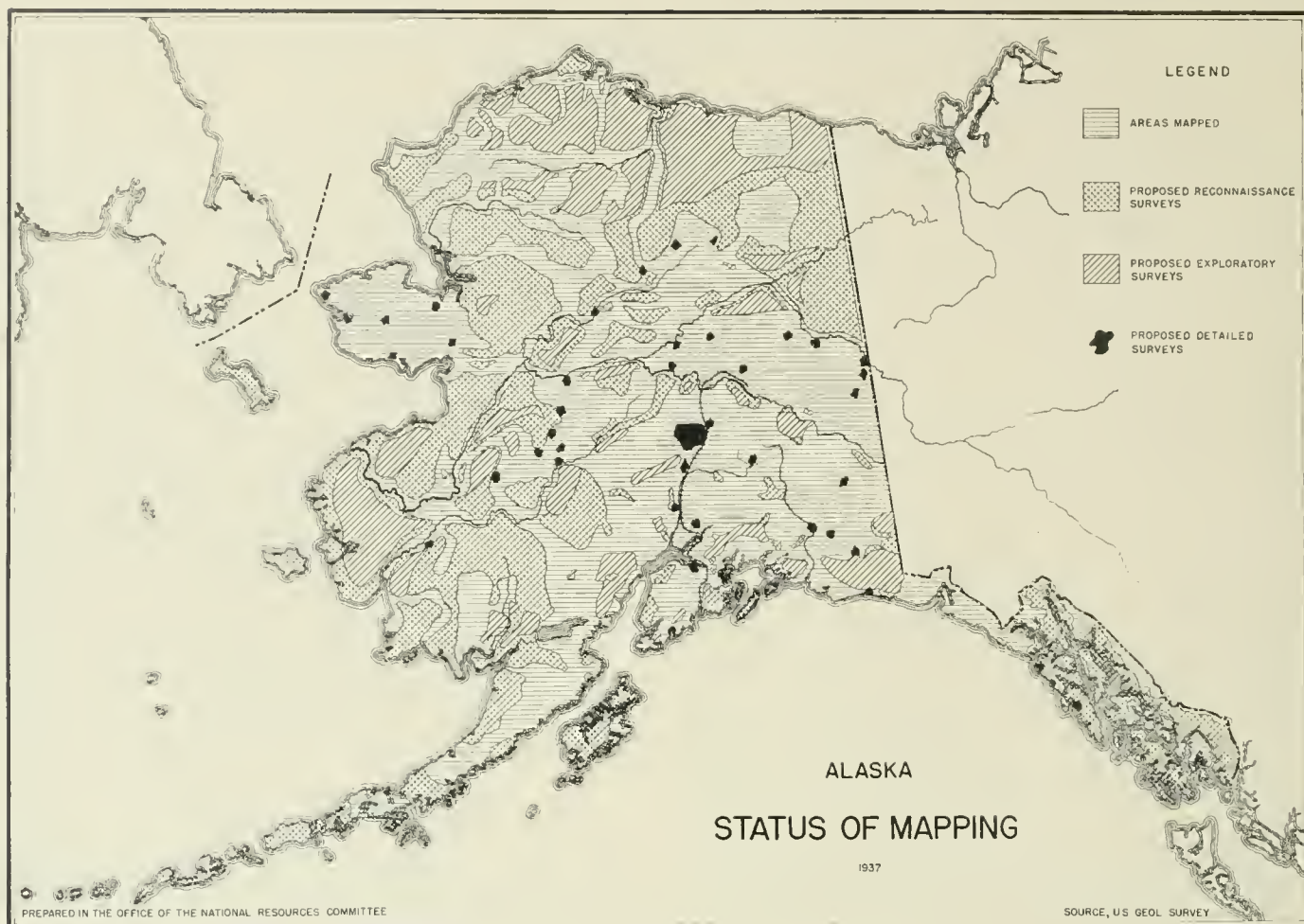


FIGURE 32

be adequate for the mapping of the present unsurveyed areas. The new area to be surveyed by the Geological Survey will doubtless be somewhat reduced because some of the original surveys, executed by the International Boundary Commission, the Navy Department, and some of the other Government organizations, can be utilized for the general-purpose maps. The precise areas that are thus available cannot be determined at this time, but it is estimated that their combined area does not exceed 10,000 square miles.

That the program thus outlined is a very conservative one is indicated by the fact that it provides for about one-quarter of the Territory being mapped only on exploratory scales (about 8 miles to the inch or smaller), 70 percent being mapped on reconnaissance scales (about 4 miles to the inch), and only a little more than 5 percent being mapped on comparatively large scales (1 mile to the inch or larger), which are practically the scales universally adopted for mapping in the continental United States.

The estimated cost of completing the control and topographic surveys of the land area of Alaska, according to the program outlined above, including the publication of the resulting maps, totals \$9,918,000, exclusive of the cost of new instruments that will be required in the work. This estimate is divided approximately \$6,000,000 for that portion of the program to be done by the Geological Survey and \$3,900,000 for that to be done by the Coast and Geodetic Survey.

Recently the general need for expediting the mapping of the United States and its possessions was made the subject of an exhaustive inquiry by the Federal Board of Surveys and Maps. As a result of that inquiry it was declared "A base map of the entire area of the United States is a national need" and further "such a base map is not only a necessity for efficient execution of Federal projects but is of vital importance in many State, county, municipal, and private activities, thus affecting the prosperity of the whole body of people." On this thesis, the estimates noted above

were prepared and submitted to the National Resources Board and to the President of the United States, and published.² As a result of the interest aroused in Congress by this study, Senate Resolution No. 281, Seventy-fourth Congress, was adopted, calling on the Secretary of the Interior to submit a plan for expediting the mapping of the United States. In response to that resolution, the Secretary of the Interior prepared a statement which was published as Senate Document 14, of the Seventy-fifth Congress, First session. This plan, in brief, presented the necessity for the work mainly as a Federal project, and recommended general acceptance of a 20-year program involving total expenditures of \$100,000,000 by the Geological Survey and the Coast and Geodetic Survey to meet the more urgent needs, but without contemplating that the mapping of the entire country could be completed for that amount. Alaska is specifically included in the report of the Secretary of the Interior, and estimates for surveys in Alaska, as well as in the United States, were carried in the appropriation bills submitted to the Bureau of the Budget.

Charts

The hydrographic surveys of the water areas and construction of nautical charts are the function solely of the Coast and Geodetic Survey, resulting in a finished product for actual use in navigating the coastal waters by the Navy, other vessels of the Federal Government, and the Merchant Marine. Since this type of surveying is necessarily carried on by the use of vessels, it is more efficient, especially in remote sections, such as Alaska, that the whole operation be carried on simultaneously by parties of the same unit; that is, the network of second order triangulation is executed, the significant topographic features of the area immediately adjacent to the coastline are surveyed, and all sounding operations are carried out by various field parties operating from the vessel and by the vessel, itself, in the offshore areas.

In view of the fact that the hydrographic surveying and construction and use of nautical charts are so closely interwoven with water transportation in Alaska, the detailed report of the Coast and Geodetic Survey on the needs for nautical charting will form a part of the staff report on Water Transportation. Only a summary of this report will be included here.

For completing the charting of the unsurveyed areas of Alaska from Dixon Entrance to Bering Strait, including the Aleutian Islands, it is estimated that about \$30,000,000 will be required. For this report, however, the Coast and Geodetic Survey has assumed a 10-year program at an estimated cost of \$16,792,000

for carrying on these field surveys and for constructing nautical charts for the whole of Alaska, south of Nushagak, leaving the greater part of the Bering Sea and the Arctic coast for such time as future development of the area may require. For the purposes of the estimate for the 10-year program, the area was divided into five sections. The following is a summary of the status of the surveys in those five sections and the cost of completing the surveys and constructing nautical charts:

Summary, nautical charts, fiscal years 1940-49

Area	Percent completed	Amount required for completion	Years to complete
Southeast Alaska (Dixon Entrance to Cape Spencer):			
Outer coast.....	100		
Inland waterways.....	60	\$3, 120, 000	10
Southwest Alaska (Cape Spencer to Seward):	80	1, 020, 000	6
Alaska Peninsula, Seward to Nushagak by Unimak Pass.....	35	6, 306, 000	10+
Aleutian Islands.....	20	4, 606, 000	10
Bering Sea.....	6	800, 000	(1)
Construction of charts, Washington, D. C.....		850, 000	10
Total expenditures required.....		16, 792, 000	

¹ Indeterminate at present.

Magnetic Surveys

Many of the navigable water areas of Alaska are magnetically disturbed and magnetic observations are necessary on the water areas in order to delineate this disturbance on nautical charts. The cost of this field work approximates \$200,000 additional to the foregoing estimate for charting.

Air Photographs

The desirability of obtaining air photographs of the unsurveyed and inadequately surveyed parts of Alaska that are of most urgent importance should be given primary consideration, both as to the feasibility of securing air photographs at reasonable cost and as to the relative advantage of such expenditure over securing the required data by ground-survey methods. Such air photographs would be especially useful for practically all planning done for the development of the Territory, for the compilation of aeronautical maps of those parts of the country for which topographic maps are not yet available, for the revision of exploratory and reconnaissance maps, and for the preparation of new maps of unsurveyed areas. Therefore, any such photographs should be taken under specifications suitable for all of these purposes.

As the compilation of aeronautical maps is one of the functions of the United States Coast and Geodetic Survey, and since that bureau has a special nine-lens camera suitable for this work, the taking of these photographs by this instrument should be carefully con-

² National Resources Board Report, Dec. 1931; p. 452.

sidered. Owing to the fact that the individual photographs taken with this camera cover a large area, they can be satisfactorily used for preliminary studies, especially in areas with little or no control, more satisfactorily than those taken with the ordinary single-lens or multiple-lens cameras.

Aeronautical Maps

For any program for the development of the resources of Alaska, it is quite apparent that aviation will play a large part. Aviation at this time is one of the principal methods of transportation in remote regions of interior Alaska, and has made comparatively accessible parts of the country heretofore only to be entered with extreme difficulty.

For this anticipated increase of the use of aircraft in Alaska, it is essential that aeronautical maps should be made available. The Coast and Geodetic Survey has had for some time a program for a series of aeronautical maps of Alaska, but to date funds have not been made available. The Bureau of Air Commerce of the Department of Commerce has urged that this program be started at the earliest possible opportunity, irrespective of whether or not funds are made available for a definite long-range program for the development of Alaska.

The program which has been tentatively planned includes eight maps on a scale of 1:1,000,000, covering southeast Alaska, the area of Alaska adjacent to the Gulf of Alaska and the Alaska Peninsula, and the Aleutian islands; also a series of three charts, scale of 1:1,500,000, for the northern and central portions of the Territory. The program as planned has not only the endorsement of the Bureau of Air Commerce as being essential and satisfactory for the commercial development of the air industry, but also has been endorsed by representatives of the War and the Navy Departments as satisfactory for military use.

It has been tentatively estimated that it will cost \$30,000 for the first editions of this series. It must be realized, of course, that these aeronautical maps will be compiled from the best data at present available for the country, and it is not intended at present to do any field work in preparation for these charts other than possibly flight checking them after compilation. Of course, subsequent expense will be incurred in the maintenance of these charts, because as air photographs and better maps of the unsurveyed regions become available these charts will have to be

extensively revised at periodic intervals. No estimate has yet been made for this anticipated future revision.

Conclusions

The foregoing briefly sketched outline of the present status of mapping and charting in Alaska indicates clearly the urgent need for the extension of some of those services. The following recommendations are submitted to meet these needs:

1. *Mapping*.—Insofar as the mapping of the land area is concerned, in view of the advanced state that has been reached by measures for expediting the mapping of the inland areas of Alaska, this report concurs with the findings of the Board of Surveys and Maps, endorses the recommendations of the Secretary of the Interior as a minimum, and urges that requests for funds by the Geological Survey and the Coast and Geodetic Survey for the purpose of carrying out this program be given favorable consideration by the Bureau of the Budget, the President, and Congress, and also that the program be continued and accelerated in subsequent years.

2. *Charting*.—Surveys of the water areas traversed by shipping to and from Alaska, as well as in foreign trade, should be carried on at a rate at least equal to that indicated in the table in the body of this report and the resulting records should be made available in the form of charts as rapidly as practicable.

3. *Aeronautical maps*.—The compilation of maps suitable for the use of aviators should be undertaken. This series should be compiled from available information and revised as new developments take place or as maps of now unsurveyed areas become available. In this work considerable aid in filling gaps between surveyed areas could be obtained from photographs taken from the air. For this reason, as well as for the fact that these photographs would also be of considerable use in other special studies, we urge that careful consideration be given to obtaining at an early date suitable photographs for cartographic purposes.

4. *Magnetic surveys*.—The facts regarding magnetic disturbances that affect the navigable waterways of Alaska form essential parts of the information that is indicated on the nautical charts. This information, collected and made available by the Coast and Geodetic Survey, provides a service that is indispensable to mariners and should be maintained at a rate sufficient to keep pace with the charting in progress.

WATER TRANSPORTATION¹

Introduction

The fact that Alaska has no land transport connections with the continental United States undoubtedly has had a profound effect on its development. Our own West was built up by successive waves of settlement along the frontier from the old centers or zones of activity, and the draft animals and covered wagons of the emigrant enabled him to provide his own transportation for the journeys. Road and railroad extensions usually followed the pioneer trails rather closely. On the other hand, Alaska now, as in the long past, can be reached only by a considerable ocean voyage; one that requires a substantial outlay of actual cash by the prospective settler and presents difficult and costly operating problems to the prospective industrialist. The implements and tools of the settler or industrial worker, the clothes he wears and much of the food he eats must be shipped over a long route. Any extensive markets for agricultural products and for the output of extracting and processing enterprises lie on the other side of this ocean journey. Also the outstanding recreational facilities of the Territory, which can contribute materially to the local cash income, require the visitor to make a substantial outlay for transportation.

In view of these facts, ocean transportation—its passenger and commodity rates, the frequency of its service and the character of its accommodations—constitutes in a large degree the “bottleneck” which determines the rate and type of Alaska development. From the days of the gold rushes the supplying of ocean transportation, adequate for immediate and prospective needs, has offered a grave problem, and one that has not yet been fully solved.

While Concurrent Resolution No. 24 requests the preparation of a “comprehensive plan for the * * * expansion and development of the facilities of commerce between the United States and Alaska * * *”, there are certain serious difficulties which are encountered in planning water transportation. It is granted that water transportation must form an integral part

of any effective development program that may be attempted for the Territory, but two factors must be kept constantly in mind: first, a large part of the private investment in steamship enterprises consists of floating equipment that can be easily shifted from one route to another, and second, the maritime industry is highly competitive. Water transportation ordinarily follows the development of industry and commerce on land. Steamship service can be provided, shifted, expanded, or contracted at points along Alaska's 25,000 miles of coastline as the volume of traffic demands. Further, since future demands for water transport facilities can not be predicted accurately unless the future economic development of the Territory can be definitely forecast, the planning of water transportation awaits the formulation of major developmental plans for the whole Territory.

Under the circumstances, however, an examination can be made of the present conditions and trends in the water-borne commerce to and from Alaska, and the data so collected will be available for future planning. Also, recommendations can be made for improvements in the present facilities with estimates for any needed public works projects. But more extensive recommendations than these can not be made until long-range planning policies for the Territory as a whole are adopted, a searching examination of its probable economic development is made, and careful estimates are compiled of the volume, origin, and destination of future shipments of goods and people to and from Alaska.

Trade Between the Continental United States and Alaska

Less than 1 percent of the cargo and passenger traffic handled in Alaska ports originates outside of the continental United States or is destined directly for foreign ports. For that reason any consideration of water transportation facilities for the Territory can be confined entirely to the commerce and services between Alaska and the ports in the continental United States.

A comparative statement of the value of exports to and imports from Alaska for the continental United States for the past 15 years is shown in table 1. The exports to Alaska before the depression and during the recovery period averaged better than 30 million dollars a year while imports from Alaska (exclusive of gold) averaged better than 50 million dollars a year.

¹ Prepared from material submitted by a group composed of Capt. W. H. Shea and Comdr. E. Reed-Hill, the Coast Guard; F. G. Frieser, U. S. Maritime Commission; Comdr. R. F. Luce and Capt. G. T. Rude, Coast and Geodetic Survey; Lt. Comdr. E. F. Helmkamp, Navy Hydrographic Office; Earl B. Hull, Bureau of Marine Inspection and Navigation; R. L. Hankinson, Bureau of Lighthouses; Lt. Col. L. E. Atkins and Capt. P. H. Timothy, Corps of Engineers; Edgar B. Calvert, Weather Bureau. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

TABLE 1.—Comparative statement of exports and imports by value, United States-Alaska trade, calendar years 1922-36, inclusive

Year	Exports to Alaska	Imports from Alaska	Gold, Alaska to United States
1922	\$26,777,806	\$51,082,995	\$5,640,978
1923	30,631,366	53,761,494	5,931,896
1924	32,046,273	54,974,168	4,602,746
1925	32,352,530	56,918,746	5,219,542
1926	31,587,337	73,300,506	5,743,076
1927	35,604,108	51,348,688	5,394,107
1928	32,058,976	67,587,207	6,352,204
1929	33,220,584	63,567,677	7,126,724
1930	31,303,291	48,996,962	7,631,737
1931	22,459,895	43,276,364	8,928,795
1932	19,573,105	30,183,355	9,261,486
1933	20,685,622	33,131,461	9,864,479
1934	29,998,840	45,058,950	15,883,877
1935	32,007,856	36,868,697	15,933,058
1936	39,060,577	60,807,603	16,653,379

Figures taken from reports of Bureau of Foreign and Domestic Commerce, Department of Commerce.

Table 2 shows the tonnage of exports and imports (including tanker traffic) between the United States and Alaska for the fiscal years 1929 to 1936, inclusive. As far as exports from the United States to Alaska are concerned, the volume of cargo movement declined steadily from 1929 through 1932, with 1933 showing practically no improvement over the previous year. However, an upward trend began in 1934 and continued steadily through 1936, the latter year representing the largest export cargo movement to Alaska during the entire 8-year period under consideration. The improvement was largely due to increased movements of foodstuffs, paper and products, petroleum, and machinery although other items also showed increases.

TABLE 2.—Comparative statement of exports and imports (including tanker traffic) United States-Alaska trade, fiscal years 1929 to 1936, inclusive

[Figures in tons of 2,240 pounds]

EXPORTS FROM THE UNITED STATES TO ALASKA

	1929	1930	1931	1932	1933	1934	1935	1936
Foodstuffs.....	3,716	8,561	6,514	6,501	5,161	6,759	7,487	9,201
Textiles.....	1,906	1,071	206	150	265	318	471	707
Paper and products.....	874	2,927	4,133	5,985	7,375	8,729	11,423	10,358
Coal and coke.....	28,574	30,788	28,765	24,359	22,626	23,439	25,501	25,957
Petroleum and products.....	92,940	87,555	74,688	56,994	58,069	87,394	90,753	185,575
Cement.....	2,241	3,103	2,177	2,578	2,097	3,215	3,616	3,835
Nonmetallic minerals.....	7,988	8,410	5,378	4,952	5,275	6,761	6,036	7,106
Iron and steel.....	57,088	47,449	41,873	35,587	33,771	42,456	43,939	41,483
Machinery.....	2,888	4,464	1,712	1,145	1,290	3,029	3,466	5,356
Vehicles.....	2,199	3,537	880	588	667	524	1,108	571
Lumber and products.....	45,150	41,131	23,902	17,985	24,272	32,493	34,542	40,795
Chemicals.....	1,748	1,783	1,462	1,269	1,259	1,549	1,377	1,679
Miscellaneous.....	97,581	97,942	90,875	77,593	78,252	89,270	103,249	111,547
Total.....	350,193	338,721	282,565	235,676	240,379	305,926	332,968	444,170

IMPORTS TO THE UNITED STATES FROM ALASKA

	1929	1930	1931	1932	1933	1934	1935	1936
Salmon.....	193,664	170,507	160,211	159,512	157,917	141,170	202,105	144,407
Fish and products.....	38,403	27,960	23,628	18,723	23,116	27,005	28,531	29,794
Hides and skins.....	86	70	55	19	12	27	26	37
Limestone.....	121,637	123,600	205,749	85,529	47,299	-----	54,927	91,793
Copper.....	67,045	67,937	43,536	20,655	5,575	2,194	911	31,138
Miscellaneous metals.....	3,818	7,845	9,047	7,546	6,226	5,738	6,077	2,495
Logs and lumber.....	2,096	4,357	6,959	1,398	1,025	625	1,309	3,109
Fertilizer.....	10,267	13,885	13,342	7,482	10,334	10,571	14,814	15,120
Miscellaneous.....	7,598	14,382	16,149	8,096	8,334	8,775	14,687	14,939
Total.....	449,944	430,543	478,676	308,960	260,138	196,105	323,387	335,832

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

The outstanding item was the movement of petroleum and products which for 1936 was practically double the movement for any preceding year.

So far as import cargo from Alaska is concerned, it will be noted that beginning with 1932 cargo fell off until 1935. The actual beginning of the slump, however, was at least a year earlier, for although 1931 shows the heaviest import cargo movement for the entire period, this was due to an abnormally large movement of limestone; practically all other important commodity items showed a decline over 1929 and 1930. Beginning with 1935 and continuing through 1936, imports to the United States from Alaska increased substantially in volume, although not equaling the peak years of this 8-year period. For 1935, the chief factor in the improvement was the unusually large movement of salmon. Shipments of limestone which, during 1934 had fallen to nothing, also resumed in 1935. For 1936, the revival of copper shipments was an important item in the improvement of import business over previous years, shipments being larger than for any period since 1931. Shipments of limestone also increased in volume. It is interesting to note that the upturn in exports to Alaska began a year earlier than the start of the upswing for the traffic from Alaska.

Table 3 shows the passenger movement between the United States and Alaska for the fiscal years 1929 to 1936, inclusive. The passenger business both northbound and southbound reached the bottom during 1933 and 1934. The upturn in both directions began in 1935 and continued with increasing volume through 1936.

During the 6-year period, 1929 to 1934, the southbound passenger movement exceeded the northbound passenger movement (exclusive of cruise passengers) by 5,564 passengers. However, for 1935 and 1936, the northbound passenger movement (exclusive of cruise passengers) exceeded the southbound movement by 5,943 passengers, which presumably indicates that much of an increase in the population of Alaska.

An examination of the detailed statistics of the Alaska trade and the transport facilities used will permit a better understanding of the situation. In order to facilitate the more detailed review of the ocean trade between the United States and Alaska, the Alaska coast has been divided into four regions as follows:

1. Southeast Alaska which comprises the Alaska Panhandle and extends from Dixon entrance on the south to Cape Spencer on the north; ports included are those from the southernmost point in Alaska, to and including Skagway, the principal port in this area being Ketchikan.

2. Southwest Alaska which includes the territory from Cape Spencer, to and including Seward, the latter being also the principal port in this area.

3. Alaska Peninsula which covers the territory from Seward to, but not including, Nushagak on the north. This area includes Cook Inlet, Kodiak Island, the northern and southern sides of the Alaska Peninsula and the Aleutian Islands.



PAN AMERICAN AIRWAYS

FIGURE 33.—Skagway—the gateway to the Klondike in the gold rush of the nineties. Hundreds of men perished in the attempt to make their way through Chilkoot Pass (in the background). Now there is a railroad through the pass 140 miles to Whitehorse—an all-day journey—an hour by plane

TABLE 3.—Comparative statement of passenger movement, United States-Alaska trade, fiscal years 1929 to 1936, inclusive

OUT-BOUND TO ALASKA								
	1929	1930	1931	1932	1933	1934	1935	1936
First class and cabin...	14,413	15,546	12,322	10,014	8,062	9,333	14,946	16,949
Second class.....	741	680	588	595	15	2	2	2
Third tourist.....	-----	17	85	-----	2	-----	-----	156
Third class.....	7,880	6,537	4,457	3,924	3,155	3,202	4,565	5,459
Total.....	22,734	22,780	17,452	14,533	11,234	12,535	19,513	22,566
Cruise.....	1,888	1,356	1,115	1,359	290	13	590	1,043
Total out-bound.....	24,622	24,136	18,567	15,892	11,524	12,548	20,103	23,609

IN-BOUND FROM ALASKA								
	1929	1930	1931	1932	1933	1934	1935	1936
First class and cabin...	16,155	15,080	14,449	11,596	8,422	9,038	11,698	16,275
Second class.....	3,865	2,872	1,122	697	307	397	56	477
Third tourist.....	-----	259	13	-----	-----	45	10	109
Third class.....	3,601	3,121	4,795	3,922	3,880	3,196	3,572	3,959
Total.....	23,621	21,332	20,379	16,215	12,609	12,676	15,316	20,820
Cruise.....	65	13	54	2	238	55	1,506	29
Total in-bound.....	23,686	21,345	20,433	16,217	12,847	12,731	16,822	20,849
Grand total out and in.....	48,308	45,481	39,000	32,109	24,371	25,279	36,925	44,458

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

4. Bering Sea which covers the territory from Nushagak North.

Exports to Alaska

Table 4 shows exports from the continental United States to Alaska (excluding tanker traffic) for the calendar year 1936. The statement is broken down to show the principal commodities, the number of tons and ports of origin and the ports of destination in Alaska, the latter being arranged according to the regions mentioned above. This statement shows that for the calendar year 1936, the total export cargo movement from the United States to Alaska, exclusive of tanker traffic, amounted to 374,802 tons of which 199,607 tons or 53 percent went to southeast Alaska; 77,883 tons or 21 percent to southwest Alaska; 59,469 tons or 16 percent went to Alaska Peninsula and Aleutian Islands; and 37,843 tons or 10 percent went to Bering Sea ports.

More than 99 percent of the cargo movement was from Puget Sound ports with 95 percent of the total movement from Seattle. A little over 10 percent of the total northbound cargo movement (excluding tankers) was by irregular services, the balance being handled by the three lines regularly engaged in the Alaska trade with fixed sailing schedules.

According to the statistics, the largest single commodity item consisted of petroleum products. Other important items were tin cans, paper boxes and cartons, and salt, most of which presumably was for the Alaska fish-packing industry. Another large item was "lumber and products." This item included some crate slats and box and barrel shooks which are also used by the fish industry. Another relatively large movement was

that of Coke which made up the greater part of the classification "Coal and coke." It should be noted that the commodity movement consisted, to a very large extent, of essential commodities with only a small percentage of what may be termed "Luxury" items. These latter items are included as a part of the classification "Miscellaneous manufactured goods."

TABLE 4.—Exports from the United States to Alaska (excluding tanker traffic), calendar year 1936

[Figures in tons of 2,240 pounds]

From—	To—				Total
	South-east Alaska	South-west Alaska	Alaska Peninsula	Bering Sea	
Seattle, Wash.:					
Refrigerator cargo.....	801	568	150	-----	1,519
Beer, wines and liquors.....	675	532	66	197	1,470
Provisions.....	3,550	2,228	333	1,428	7,539
Livestock.....	36	1,090	145	-----	1,271
Animal feeds.....	999	1,964	129	91	3,183
Lumber and products.....	6,333	9,454	11,261	4,816	31,864
Coal and coke.....	8,378	3,789	3,141	3,685	18,993
Petroleum products.....	74,889	9,347	8,395	7,912	100,543
Iron and steel commodities.....	4,340	1,689	755	578	7,362
Cement, stone, brick, and sand.....	2,744	2,296	264	649	5,953
Salt.....	1,752	738	2,356	359	5,205
Paper boxes and cartons.....	6,266	2,141	3,081	1,098	12,586
Tin cans.....	18,641	5,564	11,405	4,006	39,616
Machinery and parts.....	1,829	1,381	324	909	4,443
Autos, trucks, and tractors.....	155	520	-----	147	822
Explosives.....	808	386	2	-----	1,196
Miscellaneous manufactured goods.....	3,002	1,097	1,080	606	5,785
Miscellaneous commodities not specified.....	56,655	29,655	10,598	9,793	106,701
Total Seattle.....	191,853	74,439	53,485	36,274	356,011
Bellingham, Wash.:					
Refrigerator cargo.....	-----	-----	4	-----	4
Provisions.....	82	-----	220	13	315
Animal feeds.....	1	-----	-----	-----	1
Lumber and products.....	856	-----	4,325	42	5,223
Coal and coke.....	2,960	-----	226	-----	3,186
Petroleum products.....	120	-----	169	-----	289
Iron and steel commodities.....	41	-----	147	-----	188
Salt.....	125	-----	138	35	298
Paper boxes and cartons.....	251	-----	73	-----	324
Tin cans.....	-----	57	-----	-----	57
Machinery and parts.....	26	-----	35	1	62
Miscellaneous manufactured goods.....	66	-----	47	1	114
Miscellaneous commodities not specified.....	66	-----	165	6	237
Total Bellingham.....	4,594	-----	5,606	98	10,298
Eagle Harbor, Washington: Lumber.....	371	-----	-----	407	778
Everett, Wash.:					
Lumber and products.....	1,949	2,097	42	-----	4,088
Petroleum products.....	-----	157	-----	-----	157
Total Everett.....	1,949	2,254	42	-----	4,245
Tacoma, Wash.:					
Beer, wines, and liquors.....	6	-----	-----	3	9
Provisions.....	15	-----	-----	203	218
Animal feeds.....	38	-----	-----	-----	38
Lumber.....	235	-----	-----	12	247
Miscellaneous manufactures.....	-----	-----	-----	48	48
Miscellaneous commodities not specified.....	546	-----	-----	7	553
Total, Tacoma.....	840	-----	-----	273	1,113
Total, Puget Sound.....	199,607	76,693	59,133	37,052	372,485
Astoria, Oreg.:					
Refrigerator cargo.....	-----	-----	-----	10	10
Provisions.....	-----	-----	-----	64	64
Lumber.....	-----	-----	-----	84	84
Coal and coke.....	-----	-----	-----	55	55
Petroleum products.....	-----	-----	-----	58	58
Iron and steel commodities.....	-----	-----	-----	4	4
Salt.....	-----	-----	-----	32	32
Paper boxes and cartons.....	-----	-----	-----	70	70
Tin cans.....	-----	-----	-----	155	155
Machinery and parts.....	-----	-----	-----	24	24
Miscellaneous manufactured goods.....	-----	-----	-----	3	3
Miscellaneous commodities not specified.....	-----	-----	-----	22	22
Total, Astoria.....	-----	-----	-----	581	581

TABLE 4.—Exports from the United States to Alaska (excluding tanker traffic), calendar year 1936—Continued
[Figures in tons of 2,240 pounds]

From—	To—				Total
	South-east Alaska	South-west Alaska	Alaska Peninsula	Bering Sea	
Portland, Oreg.:					
Refrigerator cargo.....			32	5	37
Provisions.....			74	32	106
Lumber.....			150		150
Iron and steel commodities.....			5	4	9
Machinery and parts.....			30	15	45
Miscellaneous manufactured goods.....			35	19	54
Miscellaneous commodities not specified.....			10	10	20
Total, Portland.....			336	85	421
Total, Columbia River.....			336	666	1,002
Los Angeles, Calif.:					
Provisions.....		170			170
Machinery and parts.....		1,020			1,020
Total, Los Angeles.....		1,190			1,190
San Francisco, Calif.:					
Provisions.....				25	25
Coal and coke.....				23	23
Petroleum products.....				18	18
Miscellaneous commodities not specified.....				59	59
Total, San Francisco.....				125	125
Total, California.....		1,190		125	1,315

RECAPITULATION

Puget Sound.....	199,607	76,693	59,133	37,052	372,485
Columbia River.....			336	666	1,002
California.....		1,190		125	1,315
Total.....	199,607	77,883	59,469	37,843	374,802
Commodities:					
Refrigerator cargo.....	801	568	186	15	1,570
Beer, wines, and liquors.....	681	532	66	200	1,479
Provisions.....	3,647	2,398	627	1,765	8,437
Livestock.....	36	1,090	145		1,271
Animal feeds.....	1,038	1,964	129	91	3,222
Lumber and products.....	9,714	11,551	15,778	5,361	42,434
Coal and coke.....	11,338	3,789	3,367	3,763	22,257
Petroleum products.....	75,009	9,504	8,564	7,988	101,065
Iron and steel commodities.....	4,381	1,689	907	586	7,563
Cement, stone, brick, and sand.....	2,744	2,296	264	619	5,953
Salt.....	1,877	738	2,494	426	5,535
Paper boxes and cartons.....	6,517	2,141	3,154	1,168	12,980
Tin cans.....	18,641	5,564	11,462	4,161	39,828
Machinery and parts.....	1,855	2,401	389	949	5,594
Autos, trucks, and tractors.....	155	520		147	822
Explosives.....	808	356	2		1,196
Miscellaneous manufacturers' goods.....	3,068	1,097	1,162	677	6,004
Miscellaneous commodities not specified.....	57,267	29,655	10,773	9,897	107,592
Total.....	199,607	77,883	59,469	37,843	374,802

NOTE.—Southeast Alaska comprises the Alaska Panhandle, Ketchikan to Skagway inclusive, or from Dixon Entrance on the south to Cape Spencer in the north. Southwest Alaska extends from Cape Spencer to and including Seward. Alaska Peninsula covers from Seward to, but not including, Nushagak and includes Cook Inlet, Kodiak Island, Alaska Peninsula, and Aleutian Islands. Bering Sea covers territory Nushagak and North.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

Table 5 shows exports in tankers from the United States to Alaska for the calendar year 1936. The total movement amounted to 81,507 tons, of which 63,232 tons or approximately 78 percent came from California ports. The balance of 18,275 tons (22 percent) was exported from Puget Sound ports. 55,273 tons or 68 percent of the tanker traffic went to southeast Alaska. The tanker cargo consisted chiefly of Diesel oil, fuel oil, and gasoline.

Table 6 is a statement of representative ocean freight rates from Seattle to specified ports in Alaska. These rates were taken from freight tariffs of the Alaska Steamship Co. and the Northland Transportation Co. on file with the Division of Regulation of the United States Maritime Commission. A review of the tariffs of other carriers indicates that slightly lower rates are available to ports in the Ketchikan-Juneau range via other services. No survey of the rates of the carriers furnishing occasional service from Seattle to Alaska has been attempted; however, it is believed that most of such carriers, when offering a common carrier service, base their rates on the rates of the Alaska Steamship Co. It may be safely said that the bulk of the freight movement is at approximately the rates of

TABLE 5.—United States-Alaska trade, exports in tankers, calendar year 1936

[Figures in tons of 2,240 pounds]

From—	To—				Total
	South-east Alaska	South-west Alaska	Alaska Peninsula	Bering Sea	
Bellingham, Wash.....	1,400				1,400
Edmonds, Wash.....	130				130
Port Angeles, Wash.....		3,000			3,000
Seattle, Wash.....	13,742		3		13,745
Total, Puget Sound.....	15,272	3,000	3		18,275
El Segundo, Calif.....	13,686				13,686
Los Angeles, Calif.....		3,785			3,785
San Francisco, Calif.....	26,315	6,251	5,912	7,283	45,761
Total, California.....	40,001	10,036	5,912	7,283	63,232
Graud total.....	55,273	13,036	5,915	7,283	81,507

NOTE.—Southeast Alaska comprises the Alaska panhandle, Ketchikan to Skagway inclusive—or from Dixon entrance on the south to Cape Spencer in the north. Southwest Alaska extends from Cape Spencer to and including Seward. Alaska Peninsula covers from Seward to, but not including Nushagak, and includes Cook Inlet, Kodiak Island, Alaska Peninsula, and Aleutian Islands. Bering Sea covers territory Nushagak and north.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

TABLE 6.—Representative ocean freight rates from Seattle to ports in Alaska

[Rates are per 100 pounds unless otherwise indicated]

Commodity	To—			
	Ketchikan	Seward	Dutch Harbor	Nushagak
Meats (refrigerator).....	1.45	2.45		
Potatoes and onions.....	.45	.75	1.50	1.81½
Livestock.....	1 30.00	1 40.00		
Feed, animal.....	.40	.65	1.20	1.45
Lumber.....	2 8.00	2 14.00	1.20	1.45
Coal.....	.25	.30	.60	.72½
Petroleum products.....	3.35/ 17½	3.65/ 32½		
Iron and steel.....	.45	.90	1.20	1.45
Salt, common (sacks or barrels).....	.30	.32½	.50	.50
Tin cans, empty set-up.....	4.15	4.16½	.60	.72½

¹ Per head applies to cattle, horses, mules, etc., over 12 months old.

² Per 1,000 feet board measure—lengths not over 32 feet.

³ Amount before slash is per 100 pounds; amount after slash is per cubic foot. Vessel uses basis creating greater revenue.

⁴ Per cubic foot.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

the Alaska Steamship Co. and the Northland Transportation Co.

Imports From Alaska

Table 7 shows imports to the United States from Alaska for the calendar year 1936. This shows a total movement of 422,649 tons, of which 231,445 tons or 55 percent was from southeast Alaska; 63,271 tons or 15 percent from southwest Alaska; 103,872 tons or 24½ percent from Alaska Peninsula and Aleutian Islands, and 24,061 tons or 5½ percent from the Bering Sea.

Most of the southbound movement was to the Puget Sound and 385,950 tons or 91 percent of the 1936 cargo went to that area, the bulk of the movement being to Seattle. Of the remainder, 31,451 tons or approximately 7 percent went to California ports. This cargo consisted chiefly of herring and pilchard oil. In excess of 40 percent of the southbound movement was via irregular services. At least two-thirds of the inbound freight consisted of fish or fish products. These commodities are listed in table 7 as "Refrigerator cargo" which was for the greater part frozen fish, "Canned goods," which was chiefly canned salmon, "Fish, dried, salt, or pickled," "Other fish oils," which was almost entirely herring and pilchard oil, and "Fertilizer," most of which was fish meal.

The second largest item was lime. This, however, should be disregarded from the point of view of regular steamship services as it was a special movement via irregular services from View Cove to Seattle.

Another large movement which was carried by the regular lines was 28,519 tons of ore and concentrates. Most of this cargo came from Cordova and for the larger part was copper ore and concentrates although a fair volume of gold, silver, and lead ores moving from other Alaska ports is included under this heading.

Table 8 shows representative ocean freight rates from specified ports in Alaska to Seattle. The situation with respect to southbound rates is similar to that covering northbound rates which has already been touched upon.

Passenger Traffic

Table 9 shows the passenger movement between the United States and Alaska for the calendar year 1936 segregated as to classes. It will be noted that far the greater proportion of the business both northbound and southbound is first class. The next largest movement consists of third class or steerage passengers. The cruise passengers shown under the outbound passenger movement represent special cruises made to Alaska. Practically the entire passenger movement northbound and southbound is via Seattle. This statement shows a total of 18,617 outbound passengers to

Alaska and a total of 20,502 inbound passengers from Alaska and 4,996 cruise passengers, making a total passenger movement for the year of 44,115 passengers. While most of these passengers were handled by the lines operating regular services, a total of 732 northbound passengers and 1,206 southbound passengers were carried by irregular services; many of the passengers taken by the irregular services went to or came from points north of Seward.

Table 10 shows the minimum passenger fares between Seattle and ports in Alaska. These are the minimum fares of the Alaska Steamship Co., which is the principal passenger-carrying line in the United States-Alaska trade. The rates shown in this statement may therefore be taken as indicative of the rates charged for this trade as a whole.

Steamship Services

Three steamship lines operate regular services between the United States and Alaska. For all of these Seattle is the base port in the United States. These lines are: Alaska Steamship Co., Alaska Transportation Co., and the Northbound Transportation Co.

Table 11 shows the approximate schedule frequencies of these lines between Seattle and specified Alaskan ports. The Alaska Steamship Co. is the only carrier which regularly serves Alaskan points north of the Alaska Panhandle. The Alaska Steamship Co. furnishes a minimum weekly service the year round between Seattle and principal Alaskan ports as far north as Seward. During the summer season, the company greatly increases its sailings and runs a monthly direct service from Seattle to the Alaska Peninsula, Aleutian Islands, and Bering Sea ports, including Nome and St. Michael. In addition, feeder services are run practically the year round to and from northern Alaska points to connect with the regular service of the Alaska Steamship Co. from Seattle to Seward and Cordova.

TABLE 7.—Imports to the United States from Alaska (excluding tanker traffic), calendar year 1936

[Figures in tons of 2,240 pounds]

To—	From—				Total
	South-east Alaska	South-west Alaska	Alaska Peninsula	Bering Sea	
Seattle, Wash.:					
Refrigerator cargo.....	11,530	5,493	1,389	2,809	21,221
Canned goods.....	70,013	20,138	40,718	5,749	136,618
Fish, dried, salted and pickled.....	3,583	3,134	3,500	407	10,622
Whale and sperm oil.....	13,177	3,141	10,166	209	26,693
Other fish oils.....	3,369				3,369
Lumber.....	90,901				90,901
Lime.....	4,562	2,803	555	145	8,065
Ores and concentrates.....	7,739	2,941	4,358		15,038
Fertilizer.....		865			865
Coal.....	4,514	1,663	784	366	7,327
Miscellaneous.....					
Total, Seattle.....	209,388	40,178	64,675	9,685	323,926

TABLE 7.—Imports to the United States from Alaska (excluding tanker traffic), calendar year 1936—Continued

[Figures in tons of 2,240 pounds]

To—	From—				Total
	South-east Alaska	South-west Alaska	Alaska Peninsula	Bering Sea	
Bellingham, Wash.:					
Refrigerator cargo.....	253	1,181			1,434
Canned goods.....	14,650	775	8,740	5,044	29,209
Fish oils.....	228		3,367	1,102	4,697
Lumber.....	448				448
Fertilizer.....	428				428
Coal.....	50				50
Miscellaneous.....	289	73	201	73	636
Total Bellingham.....	16,346	2,029	12,308	6,219	36,902
Everett, Wash.: Canned goods.....			210		210
Poulsbo, Wash.: Fish, dried, salt and pickled.....				450	450
Tacoma, Wash.:					
Refrigerator cargo.....	11				11
Canned goods.....	542	333	1,368		2,243
Fish oils.....	1,710				1,710
Lumber.....	41				41
Ores and concentrates.....	503	19,861			20,454
Miscellaneous.....	3				3
Total Tacoma.....	2,900	20,194	1,368		24,462
Total Puget Sound.....	228,634	62,401	78,561	16,354	385,950
Astoria, Oreg.:					
Canned goods.....				2,076	2,076
Miscellaneous.....				89	89
Total Astoria.....				2,165	2,165
Portland, Oreg.: Miscellaneous.....				1	1
Total Columbia River.....				2,166	2,166
Los Angeles, Calif.: Canned goods.....		468			468
San Francisco, Calif.:					
Canned goods.....	59	72	6,352	1,958	8,441
Fish, dried, salt, and pickled.....			47	1,388	1,435
Fish oils.....			18,493	2,131	20,624
Fertilizer.....			106		106
Miscellaneous.....			313	64	377
Total San Francisco.....	59	72	25,311	5,541	30,983
Total California.....	59	540	25,311	5,541	31,451
Baltimore, Md.: Canned goods.....	800				800
Philadelphia, Pa.: Canned goods.....	270				270
New York, N. Y.: Canned goods.....	1,340	50			1,390
Wilmington, N. C.: Canned goods.....	1	100			101
Corpus Christi, Tex.: Canned goods.....	100				100
Houston, Tex.: Canned goods.....	149				149
New Orleans, La.: Canned goods.....	92	180			272
Total Atlantic and Gulf.....	2,752	330			3,082

RECAPITULATION

Puget Sound.....	228,634	62,401	78,561	16,354	385,950
Columbia River.....				2,166	2,166
California.....	59	540	25,311	5,541	31,451
Atlantic and Gulf.....	2,752	330			3,082
Total.....	231,445	63,271	103,872	24,061	422,649
Commodities:					
Refrigerator cargo.....	11,794	6,674	1,389	2,809	22,666
Canned goods.....	88,016	22,116	57,388	14,827	182,347
Fish, dried, salt, or pickled.....	3,583	3,134	3,547	2,215	12,509
Whale and sperm oil.....			3,205		3,205
Other fish oils.....	15,115	3,141	32,026	3,442	53,724
Lumber.....	3,858				3,858
Lime.....	90,901				90,901
Ores and concentrates.....	5,155	22,664	555	145	28,519
Fertilizer.....	8,167	2,941	4,964		15,572
Coal.....	50	865			915
Miscellaneous.....	4,806	1,736	1,298	593	8,433
Total.....	231,445	63,271	103,872	24,051	422,649

NOTE.—Southeast Alaska comprises the Alaska Panhandle, Ketchikan to Skagway, inclusive, or from Dixon entrance on the south to Cape Spencer in the north. Southwest Alaska extends from Cape Spencer to and including Seward. Alaska Peninsula covers from Seward to, but not including, Nushagak, and includes Cook Inlet, Kodiak Island, Alaska Peninsula, and Aleutian Islands. Bering Sea covers territory Nushagak and north.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

TABLE 8.—Representative ocean freight rates from specified ports in Alaska to Seattle

[Rates are per cubic foot unless otherwise indicated]

Commodity	From Ketchikan	From Seward	From Dutch Harbor	From Nushagak
Fish, fresh (ref.).....	\$0.22½	\$0.32½		
Fish, dried, salt, and pickled.....	.17½	.20½	\$0.25	\$0.25
Fish, canned.....	1.35/1.17½	1.40/20	.30	.36½
Lumber, Alaska spruce and cedar (in lots of 100,000 feet or over).....	15.00			
Ore and concentrates (valuation not exceeding \$60 per ton).....	1.25	1.27½	1.60	1.72½
Fertilizer, viz fish and whale meal.....	1.35	1.40		

¹ Amount before oblique line is per 100 pounds; amount after oblique line is per cubic foot. Vessel uses basis creating greater revenue.

² Per 1,000 feet board measure.

³ Per 100 pounds.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

TABLE 9.—United States-Alaska trade, passenger movement, calendar year 1936

OUTBOUND

	To south-east Alaska	To south-west Alaska	To Alaska Peninsula	To Bering Sea	Total
From Seattle:					
1st class.....	7,441	4,462	438	708	13,049
Cabin.....	2				2
3d tourist.....			156		156
3d class.....	2,304	2,113	242	751	5,410
Total.....	9,747	6,575	836	1,459	18,617
Cruise.....					4,910
Total outbound.....	9,747	6,575	836	1,459	23,527

INBOUND

To Bellingham:					
1st class.....	2			34	36
3d class.....				66	66
Total Bellingham.....	2			100	102
To Tacoma:					
1st class.....	7	16			23
3d class.....		2			2
Total Tacoma.....	7	18			25
To Seattle:					
1st class.....	9,257	4,840	653	449	15,199
Cabin.....	270	68	5		343
2d class.....	81	506	230		817
3d tourist.....	285	3	2	17	307
3d class.....	1,790	993	508	545	3,836
Total Seattle.....	11,683	6,410	1,398	1,011	20,502
Cruise.....					86
Total inbound.....	11,683	6,410	1,398	1,011	20,588
Grand total outbound and inbound.....	21,430	12,985	2,234	2,470	44,115

NOTE.—Southeast Alaska comprises the Alaska Panhandle, Ketchikan to Skagway, inclusive, or from Dixon entrance on the south to Cape Spencer in the north. Southwest Alaska extends from Cape Spencer to and including Seward. Alaska Peninsula covers from Seward to, but not including, Nushagak and includes Cook Inlet, Kodiak Island, Alaska Peninsula and Aleutian Islands. Bering Sea covers territory Nushagak and north.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

The Northland Transportation Co. maintains weekly service the year round between Seattle and southeast Alaska. In addition, this company has from one to two steamers a year which they load at Alaska points with canned salmon and carry via Seattle and other Pacific coast ports and the Panama Canal to Atlantic and Gulf ports.

TABLE 10.—Minimum all-year passenger fares between Seattle and ports in Alaska

Between Seattle and—	Minimum first class, A or B deck	Minimum first class, C deck	Steerage
Ketchikan.....	\$36.00	\$31.50	\$19.00
Wrangell.....	41.00	36.50	21.50
Petersburg.....	43.50	38.00	22.50
Juneau.....	48.50	43.50	25.00
Haines.....	52.50	47.50	28.00
Skagway.....			
Sitka.....	69.00	61.50	39.00
Cordova.....			
Valdez.....	70.00	62.50	39.50
Seward.....	72.50	65.00	41.00
Nome.....	80.00-110.00	80.00-90.00	53.00
St. Michael.....			

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

TABLE 11.—Approximate schedule frequencies of steamship lines in regular service between Seattle and Alaskan ports

Alaskan ports	Alaska Steamship Co.		Alaska Transportation Co., summer and winter	Northland Transportation Co., summer and winter
	Summer	Winter		
Ketchikan.....	4 per week	Weekly	2 per month	Weekly
Wrangell.....	3 per week	do	do	Do.
Petersburg.....	do	do	do	Do.
Juneau.....	4 per week	do	do	Do.
Haines.....	Weekly	do	do	
Skagway.....	do	do		
Sitka.....	do	do		Do.
Cordova.....	2 per week	do		
Valdez.....	Weekly	do		
Seward.....	2 per week	do		
Yakutat.....	Monthly	Monthly		
Latouche.....	do	do		
False Pass.....	Monthly	do		
Unalaska.....	do			
Nome.....	do			
St. Michael.....	do			
Oolovin.....	do			
Teller.....	2 per year			
Pribilof Islands.....	do			

Freight service also furnished by the above lines to and from other Alaskan ports as cargo conditions warrant.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

TABLE 12.—Particulars of vessels regularly engaged in the Alaskan trade

Line	Name of vessel	Type	Gross tons	Dead weight tonnage	Net tons	Refrigerator space, cubic feet	Bale, cubic	Year built	Speed	Fuel	Passenger capacity						Owner
											Total	First	Second	Third	Intermediate	Steerage	
Alaska Line	<i>Alaska</i>	Combination	4,658	3,000	2,775	10,466	116,000	1923	17	Oil	382	248				134	Alaska Steamship Co., Inc.
	<i>Aleutian</i>	do	6,361	5,145	3,901	12,020	153,000	1906	16	Oil	496	334				162	Do.
	<i>Baranof</i>	do	5,065	5,325	2,986	7,799	264,000	1919	13½	Oil	297	139				158	Do.
	<i>Bering</i>	Freight	2,361	2,475	1,391	35,537	115,000	1918	9½	Oil							Do.
	<i>Cordova</i>	Combination	2,089	2,877	1,269	1,101	126,071	1912	10	Oil	177	92				85	Do.
	<i>Curoco</i> (from Cordova).....	do	1,548	1,875	1,144	1,550	63,000	1895	11	Oil	107	56		51			Do.
	<i>Delwood</i>	Combination	3,923	5,264	2,489	4,377	196,000	1920	12	Oil	269	62			57	150	Do.
	<i>Depere</i>	Freight	3,475	5,075	2,063		202,000	1920	10	Oil							Do.
	<i>Derbly</i>	do	3,475	5,075	2,065	2,012	200,000	1920	10	Oil							Do.
	<i>Lokine</i>	Combination	2,059	2,400	1,233	1,441		1913	10	Oil	178	82				96	Do.
	<i>Latouche</i>	Freight	2,332	2,940	1,481		127,670	1910	9½	Oil							Do.
	<i>Mount McKinley</i>	Combination	4,932	5,000	2,950	9,349	254,000	1918	13½	Oil	242	148				94	Do.
	<i>Northwestern</i>	do	3,064	2,445	1,949	18,572	89,985	1889	13½	Oil	336	179				157	Do.
	<i>Oduna</i>	Freight	3,474	5,390	2,071		212,000	1920	10	Oil							Do.
Alaska Transportation Co.	<i>Sorr</i> (Seward).....	Combination	525	600	309			1912		Oil							Do.
	<i>Tanana</i>	Freight	3,474	5,390	2,064		232,000	1920	10	Oil							Do.
	<i>Victoria</i> (Oct 9, Seattle, Juneau, Nome, Golovin).....	Combination	3,914	3,066	2,355	16,577	98,000	1870	14	Oil	475	269				206	Do.
	<i>Yukon</i>	do	5,863	3,870	3,638	24,837	130,000	1899	15	Oil	428	306				122	Do.
	<i>Evelyn Berg</i>	Freight	650	1,200	423			1905		Oil							Alaska Transportation Co., Inc.
	<i>Zopora</i> (stranded April 1937).....	do	479	572	395			1905		Oil							Do.
Northland Transportation Co.	<i>North Haven</i>	do	4,653	6,631	2,981		321,000	1919	9	Oil							Northland Transportation Co.
	<i>North Pacific</i>	do	2,632	3,500	1,610		131,000	1919	10	Oil							Do.
	<i>North Sea</i>	Combination	3,133	3,500	1,903	20,282		1918	12	Oil	350	150				200	Do.
	<i>Northland</i>	do	1,255	1,668	754			1929	12½	Oil	65	56	9				Do.

Data prepared by the Division of Operations and Traffic, U. S. Maritime Commission.

In addition to the services of the regular lines, a great variety of service is offered by carriers following no regular route and offering no regular frequency of service. Some of these are with vessels owned by salmon canneries carrying their own business; others are chartered vessels.

Table 12 shows particulars of United States flag vessels regularly engaged in the Alaskan trade. With the exception of the *Northland* built in 1929 and the *Alaska* built in 1923, there is not a vessel in this trade which is under 18 years of age. Ten of the twenty-four vessels listed are more than 25 years old. Sixteen of the twenty-four vessels are listed at speeds of 12 knots or under. The data at least indicate that the Alaska fleet is in need of modernization.

Ocean Trade Between Canada and Alaska

Two Canadian lines serve Alaska from Vancouver and Prince Rupert, British Columbia. These are the Canadian Pacific (a part of the Canadian Pacific Railway system) with five steamships in the service, and the Canadian National (a subsidiary of the Canadian National Railways) with three steamships in the service.

All sailings of the above two Canadian lines are from Vancouver via British Columbian ports such as Powell River, Ocean Falls, Alert Bay, Prince Rupert, to Ketchikan, Wrangell, Juneau, Taku Glacier, Skagway, and sometimes Sitka, Alaska.

Statistics are not immediately available as to the amount of freight handled by these Canadian services. According to information obtained from unofficial

sources, it appears that practically all of the freight carried by these lines originates in Canada and passes in bond through Wrangell and the Stikine River or via Skagway for final delivery into Canadian Yukon and northern British Columbia.

The Canadian National service is maintained only during the summer months of June, July, and August. Between September and the first of June, they have no service. The Canadian Pacific, however, runs one vessel the entire year as far as Skagway. During the summer tourist season, this service is augmented with the four other vessels.

Regulation

The Alaska coastwise trade and the trade between the United States and Alaska are subject to the coastwise laws of the United States and are therefore re-

garded as domestic trades. The United States Maritime Commission exercises no specific authority over the Alaska trade and its duties and powers with respect thereto are in general the same as those which it exercises over the United States coastwise trade other than intercoastal. The Commission has the power to require the observance of just and reasonable rates, fares, and practices in the Alaskan coastwise trade and in the trade between the United States and Alaska under section 18 of the Shipping Act, 1916. The first case heard by the Shipping Board under the regulatory provisions of the Shipping Act dealt with this matter insofar as it pertained to the Alaska trade. It is unnecessary to discuss here the general regulatory provisions of the Shipping Act of 1916 with reference to the approval of agreements between common carriers and the delegation of authority to the Com-



PAN AMERICAN AIRWAYS

FIGURE 34.—Haines, Alaska, at the right. On the left is Chilkoot Barracks, which is the only Army post in Alaska

mission to prevent the unfair or unjust treatment of shippers such as the showing of preference or prejudice in rates or the granting of deferred rebates.

Since the Alaska trade is classed as a domestic trade, the Commission cannot grant any subsidy to steamship lines in this trade either for the operation or construction of vessels. However, the Commission may extend aid for the construction of vessels in a domestic trade under section 509 of the Merchant Marine Act of 1936. This section of the act provides that:

Any citizen of the United States may make application to the Commission for aid in the construction of a new vessel to be operated in the domestic trade (exception vessels engaged solely in the transportation of property on inland rivers and canals exclusively). If such application is approved by the Commission, the vessel may be constructed and sold to such applicant under the same terms and conditions as are provided in this act for the construction and sale of vessels to be operated in foreign trade, but no construction subsidy shall be allowed (except for the cost of national-defense features which shall be paid by the Commission), and the applicant shall be required to pay the Commission not less than 25 per centum of the cost of such vessel (excluding cost of national-defense features); and the balance of such purchase price shall be paid by the applicant within twenty years in not to exceed 20 equal annual installments, with interest at 3½ per centum, secured by a preferred mortgage on the vessel sold and otherwise secured as the Commission may determine: * * *

The remainder of section 509 has to do with the construction of vessels on the Pacific coast and preferences with respect thereto. It will be noted from the portion of the section quoted that the vessel shall be constructed and sold under the same terms and conditions as provided for vessels in foreign trade. The principal terms and conditions are paraphrased as follows:

SEC. 501 (b). The plans and specifications shall be submitted to the Navy Department for examination with a view to the vessel being suitable for use of the Government in time of war or national emergency.

SEC. 502 (a). After approval of the plans and specifications by the Navy Department, bids may be secured for the construction of the proposed vessel by the Maritime Commission and if accepted, the Commission is authorized to enter into a contract with the builder and concurrently therewith to contract with the applicant for the purchase by him of the vessel upon completion.

SEC. 502 (e). Provides that the vessel may be built in a navy yard of the United States in the event that bids received from privately owned shipyards are not satisfactory.

SEC. 503. The vessel shall remain documented under the laws of the United States for not less than twenty years and so long as there remains due the United States any unpaid balance on account of the purchase price of the vessel. Requirements with respect to marine and protection and indemnity coverage are subject to section 9 of the Merchant Marine Act of 1920.

The foregoing is not intended to set forth the specific terms and conditions under which the application shall be made or the vessel constructed. For further

details one should refer to the act itself, particular reference being made to title V thereof.

From the foregoing it is apparent that long term loans at low rates of interest may be made for vessels in the Alaska trade although construction subsidies cannot be granted.

Port and Harbor Facilities

The navigable waters of the Territory of Alaska are subject to the Federal laws enacted for the protection and preservation of the navigable waters of the United States. The laws provide in effect that before structures are erected or work performed in navigable waters, a War Department permit must be obtained. The activities of the Corps of Engineers in Alaska for the maintenance and improvement of rivers and harbors for navigation embrace dredging of channels, construction of breakwaters, administration of laws affecting the navigable waters of the Territory, and surveys and examinations of waterways for the preparation of definite projects for improvement, all as authorized and directed by the Congress. The activities of the corps in Alaska are administered through the district engineer at Seattle. The district engineer is also charged with the administration of regulations prescribed by the Secretary of War pursuant to section 26 of an act of Congress approved June 6, 1900, governing dredging of gold or other precious metals in the Bering Sea.

The ports of entry in Alaska are Juneau, Cordova, Craig, Eagle, Hyder, Ketchikan, Nome, Petersburg, Seward, Sitka, Skagway, Unalaska, and Wrangell. This list does not in any way include all the harbors along the Alaska coast line which are used by various types of watercraft but it does include the major points through which ocean commerce flows to and from the Territory.

So far the Corps of Engineers has completed 10 projects in Alaska for the improvement of port facilities and these are shown in table 13.

Examination and survey investigations for harbor and channel improvements, as authorized by the Congress or committees thereof with a view to determining whether improvements may be warranted, are in progress at the following localities (it cannot be stated, pending completion of these studies, what work may be recommended):

Unga Harbor.	Wrangell Harbor.
Craig Harbor.	Seldovia Harbor.
Elfin Cove.	Mouth of Sinuk River.
Grantley Harbor at Teller.	Tanana River.
Myers Chuck Harbor.	Skagway Harbor.
Tenakee Inlet to Port Frederick on Chichagof Island Waterway.	Unalaska Harbor.

TABLE 13.—Completed work or work in progress on Alaska river and harbor projects—Army Corps of Engineers

Location	Description	Commerce	Authorized	Completion	Cost	Annual maintenance cost
Cordova Harbor.....	Provides for a sheltered harbor 10 feet in depth, to be protected by 2 breakwaters.	68,012 tons in 1936 valued at \$10,702,801.	Aug. 30, 1935	October 1938.....	\$295,000	
Dry Pass.....	Dredging the channel 60 feet wide and 6 feet deep through 5 shoals between El Capitan Passage and Shakan Strait.	No figures available; 300 to 350 fishing boats use this channel.	do.....	September 1937....	79,000	\$1,600 first year and \$800 annually thereafter.
Egegik River.....	Provides for a channel 5 feet in depth through rapids at head of river by removal of obstructing boulders.	Motorboats and sailboats, principally for fishing industry.	do ..	August 1938.....	5,000	
Ketchikan Harbor.....	Construction of a stone breakwater with concrete gap 940 feet long, and dredging to provide a protected anchorage 10 feet in depth.	174,208 tons in 1936 valued at \$22,603,698.	July 3, 1930	1933.....	224,945	In fiscal year 1939, \$8,000.
Petersburg Harbor.....	Dredging channel to wharves 24 feet in depth; a small boat basin 11 feet in depth; and a channel 8 feet in depth to south side of Forestry Service landing.	35,163 tons in 1936 valued at \$4,587,330.	Aug. 30, 1935	1937.....	87,462	\$1,500
Port Alexander.....	Provides for removal of ledge rock to secure a channel 15 feet deep and for a channel 2 feet in depth at the inner lagoon.	2,633 tons in 1936 valued at \$323,559.	July 3, 1930	1931.....	17,000	None.
Harbor of Refuge, Seward.	Provides for breakwaters and dredging a basin 12½ feet in depth.	83,473 tons in 1936 valued at \$9,112,736.	July 3, 1930 and Aug. 30, 1935	Work in progress..	173,200	
Stikine River.....	Annual snagging from mouth to Canadian border, approximately 30 miles.	428 tons in 1936 valued at \$102,087.	Aug. 30, 1935	August 1937.....	582	About \$600.
Wrangell Narrows.....	Provides for channel dredging to secure depths of 21, 24, and 27 feet and the removal of rock pinnacles.	359,337 tons in 1936 valued at \$43,745,485.	Mar. 3, 1925 and Aug. 30, 1935	1934.....	589,707	In fiscal year 1939, \$25,000.
Wrangell Harbor.....	Construction of rubble mound breakwater 300 feet long and dredging mooring basin 10 feet in depth.	33,274 tons in 1936 valued at \$4,004,516.	Sept. 22, 1922 and Aug. 30, 1935	1936.....	91,020	\$500.

In addition, work has been authorized or partially completed or recommended on projects covering five harbors as follows:

Sitka Harbor

Authorized August 30, 1935. Provides for channel 22 feet deep, for removal of Indian Rock, and for dredging a small boat basin 10 feet in depth at Japonski Island lagoon protected by a breakwater, at an estimated cost of \$224,000. During the fiscal year 1937, Indian Rock was removed and the 22-foot channel dredged. \$161,200 is required to complete this project and this work can be undertaken in the ensuing fiscal year if the funds are available. Commerce, 1936, 36,417 tons, valued at \$5,350,277.

Nome Harbor

Authorized August 8, 1917, and August 30, 1935. Provides for jetties at the mouth of Snake River, an 8-foot channel from Norton and Dry Creeks, and revetting of banks, at an estimated cost of \$542,450. About 50 percent of the work has been completed. \$253,000 is required to complete the project. Commerce in 1936 amounted to 21,265 tons, valued at \$4,796,622.

Juneau Harbor

Authorized August 26, 1937. Provides for boat basin 12 feet in depth and two protecting breakwaters, at an estimated cost of \$232,000. This work can be undertaken during the ensuing fiscal year provided funds therefor are made available. Commerce, 1936, 120,477 tons, valued at \$12,580,253.

Kodiak Harbor

Authorized August 30, 1935. Provides for 22-foot channel between Near Island and Kodiak Island, and for an anchorage basin, at an estimated cost of \$77,000. Undertaking of the work is delayed pending furnishing by local interests of assurances satisfactory to the Secretary of War that a cold storage plant, having a capacity of at least 5,000 tons per annum, will be constructed. Commerce, 1936, 9,768 tons, valued at \$1,659,579.

Valdez Harbor

The dredging of a small boat and seaplane basin 12 feet in depth, at an estimated cost of \$68,500, has been recommended. This work can be undertaken as soon as the project is approved by Congress and funds therefor can be made available by subsequent appropriation.

Aids and Assistance to Navigation

Aids and assistance to navigation in Alaska waters have been maintained over a period of years by several Federal agencies. Climatic conditions and a lack of exact knowledge of the waters have at times seriously hampered shipping facilities. While the knowledge of Alaska waters has been broadened considerably by the studies and investigations of Federal agencies, and aids and assistance to navigation have been maintained by the Federal government, there are still places in the Territorial waters where navigation is hazardous.

The Coast Guard has rendered aid to water transportation in Alaska since the acquiring of Territory



FIGURE 35.—Harbor at Cordova, Alaska

OFFICIAL PHOTOGRAPH, U. S. ARMY AIR CORPS

from Russia in 1867. It has operated in Alaska waters in its capacity of assisting all forms of water transportation, and also in enforcing the maritime laws in the Territory. Its assistance has extended to the whaling fleets in the Arctic, to the aid of the fishing fleets in the Bering Sea, and to the assistance of the canning fleets en route to the Bristol Bay District. The Coast Guard in carrying on this function maintains a vessel in Bering Sea until the last commercial steamer leaves, about the first week of November.

In addition to rendering physical assistance to vessels engaged in transportation in Alaska, the Coast Guard performs many duties for other departments which contribute to improving the facilities needed in maritime commerce, such as oceanographic work, surveying, weather reports, etc.

For the purpose of carrying on its work in Alaska the Coast Guard maintains three patrol boats and two cruising cutters there the year-round while one patrol

boat and three cruising cutters are assigned to Alaska from the Pacific Coast stations during the summer months. The following stations are maintained by the Coast Guard all year in Alaska: Seward, Cordova, Ketchikan, Juneau, and Nome. In 1934 the station buildings at Nome burned down and have not been rebuilt.

The establishment, operation, and maintenance of all aids to marine navigation in Alaska are the responsibility of the Bureau of Lighthouses. The navigable waters of Alaska constitute the sixteenth district of the Lighthouse Service, and aids to navigation are maintained throughout the extent of this coast line from Dixon Entrance to Bering Strait and Kotzebue Sound. Headquarters for the Alaska service are at Ketchikan.

For the annual relief of buoys, attendance of unwatched automatic lighthouses, and supplying resident light, fog signal and radio-beacon stations, two light-

house tenders are operated in this district. West of Cape Spencer one supply trip of a lighthouse tender is made each year as far as Dutch Harbor. In South-eastern Alaska, reliefs are scheduled in 6-month periods.

The aids to navigation in Alaska are classified under the following general heads:

- 11 Light stations with resident keepers.
- 7 Radiobeacon stations.
- 14 Power-operated fog signals.
- 43 Lighted buoys.
- 358 Minor lights.
- 30 Sound signals other than power fog signals.
- 292 Unlighted buoys.
- 178 Daymarks.

The exact locations of these aids to navigation can be ascertained by consulting the Pacific Coast Light List and United States Coast and Geodetic charts of Alaska waters.

The program of construction and maintenance for the Alaska Lighthouse Service has been fairly well stabilized, and allocated over a period of years. In general, this work can be classified under three headings: (1) Construction of minor lights and establishment of buoys; (2) replacement of light station buildings which are inadequate and deteriorated beyond economical repair; (3) the construction of major aids to navigation consisting of light, fog signal and radiobeacon stations including important additions to existing station facilities.

The construction of minor aids to navigation has progressed steadily and fairly uniformly for a number of years. An allotment of from \$10,000 to \$15,000 per year, made from funds appropriated for the Lighthouse Service's special projects, has financed this work. It is anticipated that this amount will be required yearly to cover the cost of normal growth and at least \$20,000 or more per year would be required to provide minor aids to meet the needs of increased navigation due to an extended program of development.

Most of the principal light stations in Alaska with resident keepers were built over 30 years ago. Some of the buildings, of wooden construction, have deteriorated beyond economical repair, are fire hazards and not suited to house the modern lighting, fog signal and radiobeacon equipment. For the past 6 years material progress has been made in the replacing these old buildings with permanent, modern concrete structures. The combined tower and fog signal building at Mary Island Light Station has just been completed and it is planned to effect a like improvement at Scotch Cap and Cape Sarichef Light Station during the working seasons of 1939-40-41, contingent however on the availability of funds. It is expected that this work will continue at about the present rate, irrespective of

any development program for Alaska, as funds are made available for the work.

The last major new aid to navigation constructed in Alaska was Cape Decision light, fog signal, and radio-beacon station, built in 1932. Major aids to navigation are projected for Ugamak Island, Cape Pankof, and at some site in the Aleutian Island group. These major aids would benefit navigation entering Bering Sea through Unimak Pass and when completed will provide the additional radiobeacon stations needed to operate in conjunction with Scotch Cap radiobeacon, enabling vessels entering Unimak Pass or sailing a great circle course to Japan and eastern Asia to fix their positions. Funds are not in sight for the establishment of these stations and the general demand from shipping interests has not been sufficient to warrant the Lighthouse Service in pushing these projects ahead of other pressing needs for aids to navigation. An extended development program for Alaska may open up trade routes which would call for other major aids to navigation which cannot be foreseen at this time but which will become a necessity if Alaska waters are to be navigated with safety.

The Bureau of Marine Inspection and Navigation maintains in Alaska a local inspection office at St. Michael and one at Juneau, each containing two local inspectors and one clerk with authority to carry on the activities and functions within the Territory, but the bulk of the vessel inspection work of Alaska shipping is carried on by the office of the local inspectors at Seattle, Wash. Approximately 35 percent of the total inspection work of the Seattle office concerns Alaska water transportation. The office of the Bureau at San Francisco, Calif., carries on the yearly inspection work on several of the larger vessels of the Alaska fishing fleet.

In addition, at the Alaska ports at which no shipping commissioner has been appointed, the business of shipping commissioner is conducted by the collector or deputy collector of customs under the supervision of the Bureau. In Alaska such duties are conducted by the collector of customs at Juneau, and his deputy collectors at the ports of Eagle, Hyder, Ketchikan, Petersburg, Seward, Sitka, Skagway, and Wrangell.

At this time, the Bureau of Marine Inspection and Navigation does not maintain a patrol fleet in Alaska waters, and the Coast Guard is at present cooperating in the enforcement of these requirements.

At the present time aid rendered by the Weather Bureau to water navigation in Alaska is included in the general service. It is not a separate project as it is on the coasts and Great Lakes of the United States and which is known as the "Storm and Hurricane Warning Service." In Alaska there are no regular

issue of storm warnings, no flags and lantern displays, and no systematic distribution of storm information by scheduled radio bulletins or otherwise. However, masters of ships, large and small, do obtain by special means reports and forecasts which are supplied from the Weather Bureau office at Juneau.

Unquestionably there is need for a systematized service for water craft in Alaska. Storm warning displays at the principal ports would be highly advantageous. In addition, arrangements should be made for numerous weather reporting stations (at lighthouses, Coast Guard stations, canneries, etc.) equipped with radios from which observations of current weather conditions can be collected at centralized Weather Bureau offices at least six times daily and at more frequent intervals when dangerous weather conditions exist. These centralized offices should prepare bulletins and make them available by broadcast from radio stations so located as to enable small boats not only to receive the regular broadcasts but to contact the radio station in an emergency with request for supplemental reports from particular points.

With fast small boats operating in ever-increasing numbers in the interior passage waters of Alaska, it

is highly important, because of narrowness of the waters and dangerous shore conditions, for operators of such boats to know what the weather is at destination and intervening places before beginning a trip; also to be able to obtain further reports en route should fog, snow, or other dangerous weather conditions set in. In fact, there is insistent demand for such aid to small boats.

Highly trained meteorologists skilled in weather forecasting should be located at certain places for the purpose of issuing the basic weather forecasts and storm warnings required for water navigation and general service (other than service to aviation which necessarily must be specially organized for that purpose). In the beginning the forecast centers should be at Juneau (controlling center), Ketchikan, and Anchorage. Other centers probably will be needed in subsequent years, depending on developments and conditions which it is now difficult to visualize.

The Coast and Geodetic Survey has the responsibility of surveying and charting the shores and coastal waters of Alaska. Coastal surveys for the purpose of constructing nautical charts have been carried on in Alaska waters by the Survey since 1882, in order

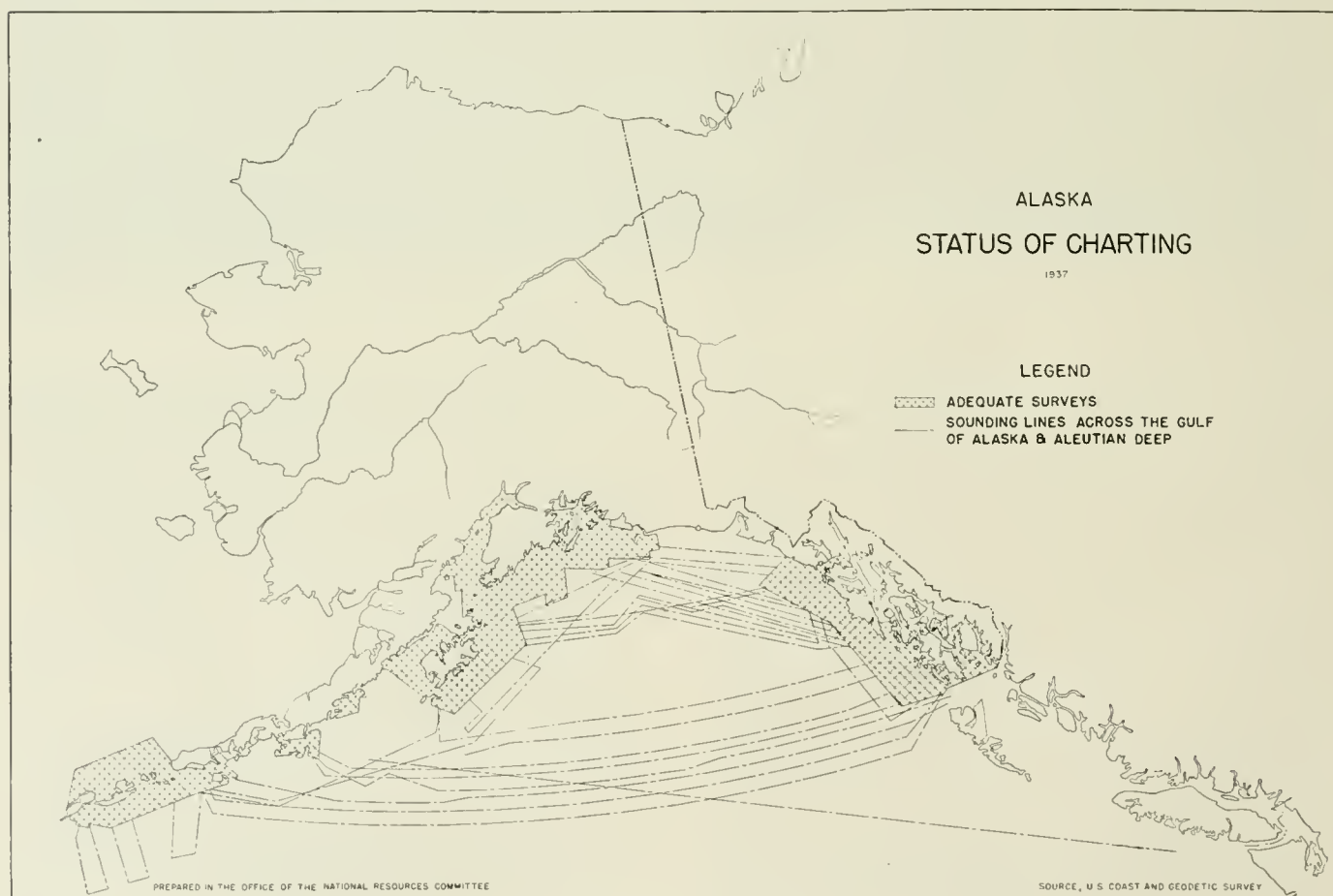


FIGURE 36

to chart the important traffic lanes and to provide safe routes for water-borne commerce. These and related activities of extending the necessary triangulation surveys, tidal and current observations, and magnetic and seismologic investigations have contributed to the gradual accumulation of adequate charts and publications which are absolutely necessary for the safety of navigation. The completion of each additional chart of an unsurveyed region contributes toward the reduction of insurance rates on vessels plying the Territorial waters.

The results of the coastal surveys, now embracing most of the Pacific coast of the Territory, are shown on the numerous editions of the nautical charts published in the Washington office of the Bureau. The charts of Alaska waters which have been completed by the Coast and Geodetic Survey are shown on figure 36.

Aside from the needs of commercial traffic, the requirements of the Coast Guard and the Navy warrant the expenditure of the comparatively small sums needed for surveys and charts. The loss of the Coast Guard Cutter *Tahoma* in 1914 was entirely due to inadequate charts and should have created an insistent demand for thorough surveys of the Aleutian Islands. The money spent by the Government on making surveys and charts of Alaska, as well as the other coasts of the country and its territorial waters, might well be considered an investment in insurance for its own vessels, including the Navy, Coast Guard, Bureau of Fisheries, Biological Survey, and others.

The field operations in connection with the coast surveys are carried on with several vessels of the Survey's fleet, together with shore parties in the region of most immediate commercial importance. In 1937 the maximum number employed at any one time in this survey work was 231. During the past 10 years the Coast and Geodetic Survey has spent annually an average of about \$250,000 on this work, including actual expenses in the field, necessary repairs to ships and equipment between working seasons and the cost of completing the records prior to their transmission to the Washington headquarters.

Conclusions and Recommendations

The almost complete dependence of Alaska on a water bridge with the rest of the United States makes safe, frequent, and reasonable cost steamship service throughout the year the business of everybody having an interest in the Territory—resident and itinerant workers, prospective settlers, commercial and pleasure visitors, present and prospective industrialists, and the outside farmers and manufacturers whose products are consumed or used in that region. Any effective plan-

ning for the future of Alaska must deal with this question of water transportation to and from continental United States as a fundamental feature.

The major Alaska activities have always been seasonal and consequently entail a great movement of people and commodities northward during a few weeks of the spring and southward during a short period in the fall. This has made a concentrated and unbalanced north-south traffic during the active season of the year and for a great dearth of traffic in the inactive winter season. One saving feature is the heavy round-trip tourist traffic of the 3 summer months. In spite of the comparatively large total volume of the business handled during the year as a whole, these great seasonal fluctuations lend little encouragement to the building up of the frequent, low-cost, continuous service by modern vessels.

The present reliance of Alaska upon water transportation service and the fact that water transport is likely to remain indefinitely the chief transport facility between the Territory and the continental United States suggests special treatment for this matter. Accordingly, it is recommended that the United States Maritime Commission investigate the needs for water transportation between continental United States and Alaska at an early date and make such recommendations for improving the service as its findings may indicate.

Pending the time such a study is completed, there are improvements which can and should be made in the present facilities for water transport and the aids and assistance to navigation. These can be provided without interfering with any future plans for water transportation for the Territory since they will be improvements only to facilitate and protect the present shipping services.

Investigational and Surveys

There is a great need for complete weather observations and records from a number of the far-flung places in Alaska which are not now obtainable because of isolation, sparse habitation, and lack of communications. In most of these cases it would be necessary to erect suitable buildings, provide radio, meteorological and other equipment, employ skilled observers, radio operators, etc. This would be expensive and might be prohibitive, especially if meteorological requirements alone are provided. However, it would be the desire of the Weather Bureau to cooperate with other Government agencies should they have need for operations in those places. This would divide the cost, give greater justification for the expenditures, and result in much economy.

Since most of the activities of the Weather Bureau are interrelated, the same weather observations are utilized in practically all of them and in considerable part the same personnel, offices, and facilities. Of course the personnel is supplemented by specialists in various lines of work. For this reason it is difficult to estimate the cost of the facilities required for an adequate service only for water navigation in Alaska.

Surveys on Alaska waters by the Coast and Geodetic Survey are needed to complete the nautical charts from Dixon Entrance to Bering Strait, including the Aleutian chain of islands. These surveys, however, should be made under a reasonable program of time and expenditure without an unreasonable expansion of the equipment and facilities of the Coast and Geodetic Survey. The operations should be carried on in the field within the limitations of the present technical field corps with the addition of about 35 deck officers and 175 members of the crew for manning the four vessels needed for the survey work, two of which will continue the surveying operations in the Aleutian Islands and the other two to take up surveying in Bering Sea.

For the purposes of laying out a 10-year program for charting Alaska waters the Territory has been divided into five areas, namely:

- Southeastern Alaska (Dixon Entrance to Cape Spencer).
- Southwestern Alaska (Cape Spencer to Seaward).
- Alaska Peninsula (Seward to Nushagak to Unimak Pass, not including Nushagak).
- Bering Sea (including Nushagak to Bering Strait).
- Aleutian Islands (Unimak Pass to Attu Islands).

The Coast and Geodetic Survey has proposed a program of surveying these five areas for a 10-year period (1940-49) which would be as follows:

Southeastern Alaska

In southeastern Alaska the surveys of the outer coast, to and including the 1,000-fathom curve, are 100 percent complete. In the inland waterways of southeastern Alaska the detailed surveys are 60 percent completed. Of the remaining 40 percent, reconnaissance surveys have been completed throughout the area and all through thoroughfares wire dragged, thereby guaranteeing these through thoroughfares safe for navigation.

Surveying operations in these waters would be carried on through a 10-year period as follows:²

In the year 1940 the work would be continued by one vessel and one tender, which are operating at the present time in those areas. In 1941 the ship *Surveyor*, now operating in the Aleutian Islands, would be detailed to the surveys in southeastern Alaska, since she

²This program covers only the areas which can be surveyed and charted during a 10-year period and does not estimate for the final completion of the entire area.

is an old vessel and should not continue operating longer in a dangerous area such as the Aleutian Islands. Beginning with 1941 the *Explorer*, which is 35 years old, would be decommissioned and that vessel replaced by the *Pioneer*, which is also an old vessel not suitable for further operations in the Aleutian Islands. At the expiration of the 10-year program, the area comprising southeastern Alaska may be considered as being adequately surveyed.

Southwestern Alaska

During the period that the Coast and Geodetic Survey has been engaged on surveys in Alaska, operations have been carried on almost continuously in the areas comprising southwestern Alaska and the surveys are about 80 percent completed. The outside coast, well offshore, has been completed except for the area from Lituya Bay, which is about 40 miles north of Cape Spencer, to Cape St. Elias. The inside waters of this area have been completed except for Yakutat Bay and some of the bays in the western and northern part of Prince William Sound.

At the present time no vessels of the Coast and Geodetic Survey are operating in southwestern Alaska. Under this program it is proposed to assign the *Discoverer* and one tender, both of which are now operating in the approaches to Unimak Pass, to this area a year beginning in the year 1944. Using these vessels by the end of the year 1949 the waters of southwestern Alaska can be considered as adequately surveyed.

Alaska Peninsula

In the waters included for the purpose of this program in the Alaska Peninsula, the Coast and Geodetic Survey has been operating for many years on the south side of the peninsula, that is, from Seward to Unimak Pass, including Cook Inlet. At the present time the surveys of Cook Inlet are completed and also from Seward to the west end of Kodiak Island with the exception of a small area from Kamishak Bay along the immediate coast of the peninsula to Portage Bay. Chignik Bay and an area north of Shumagin Islands has been completed and also the approaches to Unimak Pass. The large area from the west end of Kodiak Island to False Pass and extending well offshore is still unsurveyed except for reconnaissance.

It is estimated that the Alaska Peninsula on its south side is 65 percent completed. On the north side of the Peninsula extending from Unimak Pass to Nushagak only inadequate reconnaissance surveys have been made. As a whole therefore, the Alaska Peninsula from Seward to Nushagak by way of Unimak Pass may be considered as about 35 percent completed.

Under this program, on the south side of the Alaska Peninsula it is proposed to continue the ship *Discov-*

er for the years 1940 to 1943, inclusive, and the *Guide*, now just completing the surveys off the coast of California, beginning in 1940 and continuing throughout the 10 years of the program.

On the north side of the Peninsula between Unimak Pass and Nushagak, it is proposed to operate, beginning in 1944, the two new vessels and launches to be built in 1942 and 1943.

At the end of the 10-year period the surveys of the south side of the Alaska Peninsula will be practically completed and on the north side between Unimak Pass and Nushagak about 65 percent completed.

Aleutian Islands

The Coast and Geodetic Survey has been operating two ships a part of the time and one ship a part of the time for the past several years in the Aleutian Islands and will operate next season the ships *Discoverer* and *Pioneer* in that area. The present plans of the Bureau contemplate continuing those surveys until the Aleutian Islands are completed. At the present time the completed surveys extend from Unimak pass to the west end of Umnak Island, which constitutes about 20 percent of the surveys of the entire Aleutian chain.

In carrying on these surveys it is proposed to extend them far enough to the northward to include the Great Circle track from the United States to the Orient by the way of Unimak Pass and Attu Island north of the Aleutian chain.

Under the proposed program the ship *Surveyor* will operate during the year 1940 and the new vessel, tender, and two launches, planned to be built in 1940, would operate in the year 1941. In the year 1942 the new vessel, tender, and two launches, planned for construction in 1941, will join the other new vessel in the Aleutian Islands and the two operate to and including 1947, at which time the surveys of the Aleutian Islands will have been completed.

Upon completion of the surveys of the Aleutian Islands at the end of the fiscal year 1947, these two new vessels would be released for surveys in the Bering Sea.

Bering Sea

During the first 8 years of this program, the only work to be done in the Bering Sea would be the two vessels working north of the Alaska Peninsula between Unimak Pass and Nushagak Bay as already outlined. Upon completion of the surveys of the Aleutian Islands in 1947, the two vessels operating in that area would be assigned to other areas in the Bering Sea. These two vessels would not necessarily operate in the same local areas but would be assigned to such areas as are considered most important at the time.

At the end of the 10-year program, surveys of the Bering Sea would be only 6 percent completed, but this 6 percent will be done in the vicinity of the more important ports.

Based on the amount of field work included in this 10-year program, it will be necessary for the Coast and Geodetic Survey to prepare new charts of Alaska for the areas covered by these surveys from Dixon Entrance to Bering Strait, including the Aleutian chain of islands. It is obvious that as complete surveys of this area become available many new charts, in addition to those now planned, will be desired, but no specific number can be stated at the present time.

Magnetic surveys for furnishing the variation of the compass, which is essential to the navigator of both air and sea craft, are needed. Many of the navigable water areas of Alaska are magnetically disturbed, so that actual observations are necessary on the water areas in order to delineate this disturbance on the nautical charts.

Administrative

While from the standpoint of the Bureau of Lighthouses the present laws and regulations are in general satisfactory, there are three points for improvement which may be mentioned:

1. Extend the period of noncivil service employment for seasonal or temporary job employees. The present limit of time that employees without civil-service status, hired for construction work, can be employed is 6 months, thus necessitating the discharge of employees and the hiring of others before the end of the working season. The period should be extended from 6 to 9 months. It is often impracticable to obtain sufficient employees with civil-service status.

2. The probational period for appointed employees should be extended from 6 months to 1 year. The Lighthouse Service has employees at stations in remote localities, reached only once a year by an administrative officer. Probational periods now often expire without being able to ascertain if the employees' services during the probational periods have been satisfactory.

3. Isolation and increased living expenses incident to employment in Alaska are handicaps to extended service in this territory. The Lighthouse Service has difficulty in retaining competent employees to fill positions and the turnover in employment is high. It is believed that a salary differential covering positions requiring 12 months' service per year in Alaska would be conducive to longer term employment. Such salary differential might perhaps best be on a per centum basis to be applied to basic rates paid for similar duty in continental United States.

Public Works

It is recommended that the work on the harbors at Sitka and Nome, which is partially complete, be completed by the Corps of Engineers, and that the work on the harbors at Juneau, Kodiak, and Valdez which has been authorized be undertaken by the Corps.

The Navy Department and the Coast Guard recommend the removal of Tuscarora Rock and straightening the channel between Captain's Bay and Iliuliuk Harbor at Unalaska.

In order that the Coast Guard may properly carry on all of its work in the territory, the following public work projects are recommended. A number of these have already been requested, and others are projects which have been deemed as necessary:

1. An administration building to be built in the neighborhood of Unalaska, Alaska, for the Commander of the Bering Sea Patrol Force, this building to house him and his staff. Such a building is urgently needed to replace an old frame building.

2. A recreation building at Unalaska for the crews of the cutters stationed there during the summer months. There are in the neighborhood of 300 men stationed on units basing at Unalaska. There are insufficient recreational facilities available for the men on units while in port. Due to the bad climatic conditions, outside recreational activities are very much limited.

3. It is recommended that a storehouse be built at Unalaska to provide storerooms for each vessel attached to the Bering Sea Fleet. This is necessary since the present building is no longer suitable for storing Government supplies of any nature.

4. The Coast Guard should have some facilities at or about Unalaska for housing aircraft. It is contemplating using a plane attached to a ship during the summer months at Unalaska. Since there is not a hangar to house this plane during periods of bad weather, its use there is of very doubtful value, as the maintenance cost for the plane when exposed to the weather would be prohibitive. In addition to its use for Coast Guard planes flying from Unalaska as a headquarters, this hangar should be large enough to house any plane used at present by the Navy Department.

It is recommended that an appropriation be made available to the Bureau of Marine Inspection and Navigation to purchase for use in Alaska waters a suitable patrol boat for open rough water service of 120 feet over-all length, complete with modern equipment.

The two lighthouse tenders of the Bureau of Lighthouses stationed in Alaska are now worked to capacity to maintain the present aids to navigation. It is now estimated that an additional tender will be required by 1941.

AIR TRANSPORTATION¹

Although Alaska may not be ideally suited for aviation, aviation, on the other hand, is ideally adaptable to Alaska. The topographic and physical features of the Territory, the distribution of a sparse population, climatic and seasonal factors all combine to favor the growth and development of this the most recent of man's space- and time-conquering transportation devices.

Topography and Physical Conditions

The physical features of Alaska differ widely in the several sections of the Territory. It is not the purpose of the present report to discuss these differences in detail or to attempt a technical analysis of the physiography. Instead, mention will be made only of certain features of special concern to the development of aviation.

The enormous extent of Alaska is perhaps the most cogent physical fact that must be recognized in any plan looking to the development of the country. The great distances to be spanned through practically unsettled regions, the shortness of the effective working season at many of the mining and fishing areas, and the need for transportation at reasonable costs, combine to make the use of airplanes throughout large expanses of the Territory the only effective means of rapid and economical transportation of persons or of those things transported by plane.

In addition, the relief of the country is such that it would be difficult and economically impracticable in many parts to build and maintain highways or railroads. For instance, in southeastern Alaska, the high rugged mountains of the Coast Range, rising in places to elevations of 9,000 feet or more, present almost unsurpassable barriers to cross-country travel, especially as they are intricately cut into by many deep fiords with precipitous walls rising thousands of feet from the water's edge. These fiords and deep marine water courses have produced hundreds of islands off the mainland so that transportation between each other or with the mainland can be effected only by boats or

planes. This same general condition also prevails along almost the whole southern coast of Alaska west of southeastern Alaska for more than a thousand miles, including the Prince William Sound area, parts of the Alaska Peninsula, and in the Aleutian Islands that stretch west for an additional thousand miles from the mainland.

Everywhere north of this southern coastal portion of Alaska a mountainous region forms a gigantic backbone, in places 150 miles wide. Many of the peaks of these mountains rise to elevations of more than 10,000 feet and several of them are more than 15,000 feet high, while the culminating point, Mount McKinley, is over 20,000 feet. A few of the lower passes across these highlands have been utilized by roads or railroads, but for hundreds of miles there are no feasible routes across this mountain belt that are suitable, even for pack horse trails. Snowstorms are likely to occur in the higher parts of the ranges at all times of the year and bad weather conditions are the rule in the mountains, so that quick passage of this formidable barrier, such as can be afforded by airplanes when conditions are favorable, has led to extensive use of planes for travel across this belt.

Forming the great central part of Alaska from the northern border of the southern mountains to the southern border of the northern mountains, which lie north of the Arctic Circle, there is a relatively low rolling country traversed by the large rivers, such as the Yukon and Kuskokwim and their tributaries. In places this belt is more than 300 miles wide from north to south and 1,000 miles from east to west. The uplands in this area seldom rise to elevations of 6,000 feet, and the greater part of the country has an average elevation of perhaps 3,000 feet or less. The climate is characteristically continental in type, having short warm summers and long cold winters. Precipitation is small, probably being less than 15 inches a year throughout most of this area. A peculiar surface condition prevails throughout much of this interior region in that in many places the subsoil zone to a depth of several hundred feet is permanently frozen. This prevents normal seepage of water downward, such as occurs in the temperate regions. As a result, much of the water falling on the surface in the form of rain and snow, or that water produced by the surface melting of the frozen zone during the summer, cannot escape but remains to form a swampy treacherous surface over which travel on foot is ex-

¹ Prepared from material submitted by E. L. Yuravich and Charles P. Stanton, Bureau of Air Commerce; Paul W. Gordon, Division of Territories; Lt. Col. W. E. Farthing, Army Air Corps; Lt. Col. D. M. Crawford and Capt. V. A. Conrad, Army Signal Corps; Comdr. A. C. Davis, Navy Bureau of Aeronautics; Delbert M. Little and Edgar B. Calvert, Weather Bureau; W. E. Triem, Post Office Department; Sidney B. Smith, Department of State; Capt. Lloyd T. Chalker and Lt. Carl R. Olsen, the Coast Guard. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

ceedingly difficult, and on which it is generally impracticable, and in any case relatively expensive, to maintain good roads. Under these conditions the use of airplanes to reach outlying districts becomes the most practicable method of travel, as otherwise long circuitous journeys by boat along the water courses becomes the only alternative. This central area contains most of the important producing placer camps of the Territory. The various centers of production are widely scattered, their operating seasons are short, and many of the men employed at them leave the camps at the time of freeze-up in the fall and do not return until close to the opening of work in the spring.

Under these conditions a convenient, rapid, and economical method of transportation, such as is afforded by the use of airplanes, is especially advantageous.

The northern limit of this interior area has already been referred to as marked by the range of mountains in northern Alaska. This highland, known as the Brooks Range, while much lower than the mountains in southern Alaska, has peaks rising to about 9,000 feet, and presents a strong barrier to travel. The area occupied by the range is about 150 miles wide, north and south, by somewhat more than 600 miles east and west. It is a very sparsely settled region, probably less than 1,000 permanent inhabitants. It



PAN AMERICAN AIRWAYS

FIGURE 37.—On The Top—Here's the reason for the effect the airplane has had upon Alaska—an effect which probably has been equalled in no other country on the globe. Alaska has plenty of "flight obstructions" but the same mountainous ridges offer difficulties even greater to the traveler on the ground. So travel has taken to the air with time savings such as that on the Juneau-Fairbanks run where it takes 4 hours by plane—32 days by dog team

has a sub-Arctic climate with a very short open season and long, cold, dark winters. Some small mining camps have been established at widely separated points in these mountains, and doubtless additional ones will spring up as Alaska becomes more thoroughly developed. The delays and costs of getting into the region at present have unquestionably prevented adequate exploration of these mountains. Such handicaps could be much reduced by more extensive use of air transportation.

Northward from the Brooks Range to the coast of the Arctic Ocean, the country is dominantly of low relief, consisting of rolling uplands near the mountains, which give place northward to low, almost featureless plains, only slightly above sea level at the coast. Except for the coastal fringe it is practically uninhabited, and access to it is exceedingly difficult, except by the use of planes. Even the coastal area is cut off from ordinary means of communication for much of the year, because the ocean is open for navigation for only a month or so each summer. Except in the immediate vicinity of the villages, there are no roads at all, and even trails marked on the ground are exceedingly infrequent. In this inhospitable region the airplane has many times demonstrated its value in rushing medical aid to disease-stricken communities, in the search for lost or endangered persons, and in bringing needed supplies to isolated settlements.

Winter Temperatures and Snowfall

While winter conditions in Alaska obviously present special problems to the aviation industry, these same conditions present perhaps equal if not more difficult problems to other means of transportation. Winter temperatures are comparatively mild in extreme southern Alaska, with the average for January about 32° along the coast, but to the northward they become progressively more severe and extremely cold weather is frequent. The record for Fairbanks is representative of much of the interior of the country. Here the mean January temperature is -9° and the average annual minimum is -52°. The average number of days with zero or lower is 115, compared with the record for Bismarck, N. Dak., of 49 days and Minneapolis, Minn., 31. Snowfall is relatively heavy, the annual average amount ranging from about 100 inches in southeastern sections to from 40 to 60 inches in the interior. The Pacific coast, in general, has about 4 months without any snow, and the interior only 2 months. These weather conditions make it obviously difficult and expensive to maintain highway or railroad systems of transportation during a large part of the year; not only because of the physical problems presented but also because the principal industry of interior Alas-

ka—mining—and its attendant activities are forced to a standstill during the winter months. Airplane service may, because of its flexibility, adapt schedules and itineraries to meet conditions changing seasonally.

Population and Industry

Statistics for the calendar year 1936 taken from the report of the collector of customs, Juneau, Alaska, indicate the fisheries industry to have totaled \$51,971,206; shipments of gold and silver to have aggregated \$16,870,580; and shipments of furs, exclusive of seal skins, were valued at \$1,962,543—all sizable industries producing traffic but highly seasonal in their employment of large numbers of persons. The first two, at least, cause a significant movement of persons and supplies. Obviously, highways, railroads, and ships are better adapted to handle the bulk freight created by these industries, but on the other hand the flexibility of air routes is of distinct advantage both in exploratory work, prior to the establishment of surface routes, and in rapid movement of personnel during the short working season. In addition, in cases in which the production may not at the outset justify large capital expenditures in permanent roadways, the airplane often enables the initial developmental work to proceed to a point justifying roadways for surface transportation.

The 1930 census lists only seven cities 1,000 or over in population: Anchorage, Fairbanks, Juneau, Ketchikan, Nome, Petersburg, and Sitka. Of these, four are on all-year ocean routes and two are located on the Alaska Railroad. Nome has no convenient method of land transportation and water transportation exists only during the summer months. Rapid transportation between these points or between them and the territory dependent upon them as distributing points must be by air.

This is written of course with no intention to minimize the importance of the dog team in the early history of the Territory but in the belief that for the most part the airplane has displaced the dog team both in speed and in economy. Nor is it intended to deny the importance of water transportation, highways, or of the Alaska Railroad in the past or future development of the Territory. It is believed that the 60,000 people of Alaska scattered over an area equal to one-fifth that of continental United States, separated, at the extreme points by distances continental in extent, cannot look forward to an early connecting network of roads nor of railroads. Thus air transportation has arrived to serve in a unique way as one among several necessary means of transportation in the Territory.

Early Alaska Flights

Army Alaska Flight, 1920.—One of the first demonstrations of the feasibility of airplane travel in Alaska was a flight of four Army DeHaviland airplanes under the command of Capt. (now Maj.) St. Clair Street, United States Army Air Corps, from Mineola, Long Island, N. Y., to Nome, Alaska, and return, between July 15 and August 24, 1920. Other members participating in the flight were: Lt. (now Maj.) Clifford C. Nutt; Lt. (now Maj., Officers' Reserve Corps) Erik H. Nelson; Lt. (now Maj.) C. E. Crumrine; Lt. (deceased) Ross C. Kirkpatrick; Master Sgt. Joseph E. English, Sgt. Edmund Henriques, Sgt. James D. Long.

This flight was conceived by Brig. Gen. William Mitchell, then Assistant Chief of the United States Air Service, whose interest in Alaska and its resources was aroused while he was serving as an officer of the United States Army Signal Corps, which constructed the Government Alaska Telegraph Line. Considering the early date at which this flight was made, the type of equipment used, and the lack of navigational aids which are now considered essential to normal flight, this flight can truthfully be said to have been a decided demonstration of the practicability of air transportation in Alaska. The round-trip of 9,000 miles was completed in 112 hours of flying time. The attention of the entire Nation was attracted to the expedition, which consisted of many short flights, partly over uncharted country beyond the Great Divide of the Canadian Rockies.

First mail service.—Four years after the Army flight to Nome, the Post Office Department shipped a plane to Alaska, in order to determine the practicability of air mail service. Lt. Ben Eielson (now deceased) was chosen for these test flights. Eight were made during the months of February, March, April, and May, 1924, between Fairbanks and McGrath, Alaska, a distance of 272 miles. The average weight of mails carried on the outbound trips was 302 pounds and on the inbound trips 116 pounds. The tests terminated with the eighth flight when the plane was damaged. The test route, which required 18 days one way by dog team, was made by air in about 3 hours. So far as the records of the Post Office Department show, Lieutenant Eielson was the first carrier to perform mail service in Alaska by airplane.

Army around-the-world flight.—National attention was next drawn to Alaskan air travel in 1924 by the Army around-the-world flight of four Douglas cruisers, which covered 28,000 miles in a total flying time of 371 hours and 11 minutes. This flight can well be said as being of as great importance to the world as the accomplishment of Magellan. It was undertaken

to demonstrate the feasibility of aerial transportation and communication between continents; ability to make long flights which require the operation of aircraft over portions of the world far removed from well-organized trade routes without other extensive transportation systems; to prove that aircraft could operate under all climatic conditions; to bring before the people of the world the fact that this newest form of transportation was equal to the most rigorous flying conditions; and to bring to the United States, the birthplace of the airplane, the signal honor of being the first nation to circumnavigate the globe by air.

When the flight was first proposed it appeared that a greater chance for success lay in flying from the east toward the west. This was indicated by studies of the prevailing meteorological conditions encountered during the various seasons of the year in all of the countries over which flight was to pass during the 4½ months calculated to be necessary to cover 25,000 miles. Therefore, the flight was made across the northern Pacific in April and May to take advantage of the early open season in the Aleutian Islands and the northern Pacific.

Because of the vast uninhabited or sparsely inhabited area to be covered by this flight, the preparation of suitable landing fields along the entire route was, in itself, an immense undertaking. Because of that fact, and because the most feasible route followed the coast for a great distance, the planes were equipped with pontoons for the greater portion of the journey. This allowed landings to be made in protected harbors along the coast which greatly diminished the difficulties which would have been encountered if this flight had been undertaken with land planes. Great stretches of water had to be crossed between the Aleutian and Kurile Island Groups, the greatest being a distance of 800 miles of open sea. Flying in this part of the world is especially difficult because of the varying weather conditions, frequent storms, and the prevalence of fogs. To add to the difficulties, there were no means of communication. The distant islands of the Aleutian Group, in many cases uninhabited, had no communication with the outside world except through an occasional trading schooner and the Coast Guard.

The officers of the flight were: Maj. (now Brig. Gen.) Frederick L. Martin (started in command but was obliged to withdraw due to the loss of his airplane in a forced landing), First Lt. (now Maj.) Lowell H. Smith (assumed command), First Lt. (resigned) Leigh Wade, First Lt. (now Maj., Officers' Reserve Corps) Erik H. Nelson, First Lt. (resigned) Leslie P. Arnold, Second Lt. (now Capt. in Specialists' Reserve) John Harding, Jr., Second Lt. (deceased) John Ogden, Second Lt. (now Capt.) Alvin Harvey.

Navy survey expedition.—The first Alaska aerial mapping and reconnaissance expedition conducted by the Navy in 1926 under the command of Lt. B. H. Wyatt, demonstrated another practical use to which the airplane could be put. Three amphibian planes were assigned to the expedition, leaving San Diego, Calif., on the 24th of May and returning on the 23rd of September of the same year. The mine-sweeper *Lark* served as a seaplane tender. The mapping of islands and peninsulas in the southeastern portion of Alaska Territory proved to be of distinct value, not only to the Navy in initiating its advance into the Alaskan Regions, but also to the Departments of Interior and Agriculture, both of which utilized the photographic surveys thus made for their respective departmental mapping and timber projects.

Amundsen-Ellsworth-Nobile expedition in dirigible NORGE May 11-14, 1926.—In May 1926, Capt. Roald Amundsen, a famous Norwegian explorer, Lincoln Ellsworth, an American sportsman and explorer, and General Umberto Nobile, an Italian airship designer, left Kings Bay, Spitzbergen, with a crew of 17 in the airship *Norge* to fly over the North Pole to Alaska.

Although Nome had been the destination, storms forced a landing at Teller, a small village some miles from Nome. The distance of 2,000 miles from Spitzbergen to Point Barrow was covered in 46 hours, but because of bad storms 25 hours were required to navigate the 700 miles between Point Barrow and Teller. The actual mileage covered by the *Norge* in its flight, according to the report of Commander Nobile, pilot, was 3,291 miles.

Eielson and Wilkins flight, Point Barrow to Spitzbergen.—The flight of the *Norge* was reversed when Lt. Carl B. Eielson and Capt. George Wilkins flew their Lockhead Vega plane from Point Barrow, Alaska, to Spitzbergen in April 1928.

Carrying a considerable overload of gasoline and oil, three attempts to take off were made before they succeeded in leaving the rough and icy surface at Point Barrow. A pair of metal skis broke with each unsuccessful attempt. Temperatures encountered during the flight ranged from 33 above to 48 below zero. However, except for the inconvenience and delay of warming motors before starting in low temperatures, the cold of the Arctic did not appear at any time to prevent the proper functioning of the motors. The difficult feat of navigation over the top of the world terminated in a very severe storm at Green Harbor, Spitzbergen, where the fliers had to await the breakup of the Arctic ice to allow a boat from Norway to bring them out.

The Lindbergh flight to Japan.—A flight which attracted considerable attention was that of Col. and Mrs. Charles A. Lindbergh when they flew from

North Beach, N. Y. to Tokyo, Japan, via Canada, Alaska, and Siberia during July and August, 1931. The route led from New York to Ottawa, Canada; Point Barrow, Shishmaref and Nome in Alaska; Petropavlovsk in Siberia; on through the Kuriles Island to Tokyo, Japan. No difficulties were experienced by them during their flight over Alaskan territory.

Post-Gatty around-the-world flight.—World attention was again directed to Alaska's advantageous position with respect to intercontinental flights when Wiley Post and his navigator, Harold Gatty, landed at Solomon Beach, 36 miles from Nome, and again at Fairbanks for refueling on their flight around the world from June 23 to July 1, 1931. The only structural damage to the plane was encountered when landing at Solomon Beach. One wheel dropped into a hole in the field while taxiing, bending the wheel cowl and one blade of the propeller. Gatty sustained a shoulder injury by being struck with the propeller while cranking the engine at Fairbanks. The total distance of 15,474 miles was covered in the elapsed time of 8 days 15 hours and 51 minutes.

Post broke this record when making his solo flight around the world in 1933, completing the journey in the elapsed time of 7 days, 18 hours, and 49 minutes. During this flight he landed at the town of Flat and again at Fairbanks, in Alaska.

Army Alaskan flight.—A demonstration of the feasibility of moving a tactical unit of Army aircraft from the United States to Alaska was made in July and August 1934, with the mass flight of 10 Martin (B-10) bombers, under command of Lt. Col. (now Brig. Gen.) Henry H. Arnold, from Washington, D. C., to Fairbanks, Alaska, in 33 hours and 15 minutes flying time and elapsed time of 51½ days. Seven intermediate landing fields were used. The return flight was made via Seattle, using five intermediate landing fields, reaching Washington in approximately 29 hours flying time. The flight from Juneau, Alaska, to Seattle was made nonstop, entirely over water, following the coast line.

This flight photographed from the air 20,000 square miles of Alaskan territory in 3 days.

Alaska's favored position.—These pioneer flights have amply proven that Alaska is a natural middle station for international flights between the United States and the Orient, and that rapid development of air landing fields will be required to take care of the imminent future of this method of transportation.

Further early developments.—Impetus was given to the development of air transportation in Alaska by the Post Office Department in permitting its contractors on certain star routes to use the airplane as a means of transportation in lieu of dogsleds whenever

it was found practicable to do so. The first official recognition of this class of service was contained in the general advertisement for star route contract service for the period from July 1, 1926, to June 30, 1930. A provision was contained allowing service on any of the routes under advertisement to be performed by airplane if desired by the contractor. This resulted in the use of airplanes on a number of routes.

Commercial Flights and Humanitarian Expeditions

Probably the greatest appeal to many people is made through the use of the airplane for humanitarian purposes. No better field exists than Alaska. Nurses and doctors have been transported to outlying districts by airplane to aid in the control of influenza and other epidemics. It is not necessary to dwell upon the utility of the airplane in combating such catastrophes in areas days or weeks removed from medical aid when former methods of transportation were employed.

There are in Alaska, including 7 hospitals maintained by the Federal Government primarily for native beneficiaries, about 20 hospitals located for the most part in the larger population centers. These points also are the centers for other medical aids, clinics, physicians, and drug supplies. A large number of persons are therefore at a distance from medical attention.

The area of effective service rendered by hospital and other medical facilities are greatly increased and the isolation of the individual sufferer much diminished through the combined benefits of radio communication and air travel. The services of the airplane in rendering medical assistance are by no means limited to those epidemics of which the public has been made familiar because of dramatic exploits but extend also to the casualties of daily life in every part of the Territory.

Alaskan aerial survey.—Lakes, streams, and other important topographic features of the Tongass National Forest, southeastern Alaska, the details of which had not been known previously, were revealed by the United States Navy Alaskan aerial survey, which mapped more than 10,000 square miles of southeastern Alaska during the summer of 1929.

Before the aerial survey expedition began its work, much of the land surface of southeastern Alaska was without adequate maps. The shore lines of the islands and the mainland had been delineated but farther inland the maps were often inaccurate. The need for accurate maps of this area was considered imperative to the success of the mining, fishing, lumbering, power, and industrial development of the Territory.

The information obtained from this aerial survey was of inestimable value because of the data concerning so large an area made available in so short a time.

Aerological Weather Service

The first weather observations in Alaska by airplane were made by the Weather Bureau in October 1930 and August 1931. However, the first regularly scheduled airplane observations were made during the international polar year, August 1932 to August 1933, when a total of 60 flights were made at designated hours on international days. During the period, September 1936 to March 1937, in connection with an investigation of polar air masses, the Weather Bureau contracted for twice-daily airplane observations at Fairbanks. For the period September 1937 to March 1938, in connection with the same investigations, the Weather Bureau has contracted for airplane observations every third day at Fairbanks. Airplane observations extend to 16,500 feet above sea level and give continuous records of pressure, temperature, and humidity between the ground and that height.

The beginning of aerological weather service.—The Weather Bureau received a specific appropriation of \$26,695 for the fiscal year 1931, with which to inaugurate an airway meteorological service in aid of aviation in Alaska. No increase has been made in subsequent annual appropriations. With this first appropriation, stations manned by commissioned Weather Bureau personnel were established at Nome and Fairbanks and pilot balloon observations were taken twice daily. Also an additional employee was assigned to the Juneau station and twice-daily pilot balloon observations inaugurated there. Further about 30 cooperative and on-call weather reporting stations for furnishing weather reports at such times and under such conditions as required for the protection of airplane flights between cities in Alaska, were established and furnished with a minimum number of instruments. While the War Department has cooperated completely in the transmission of the reports over its radio system, a number of the on-call stations were located at points where such facilities were not available.

Signal Corps radio station network.—In 1900 an appropriation was made by Congress to enable the Signal Corps to inaugurate telegraph service in Alaska, and in 1903 another appropriation was made for a cable from Seattle into the Territory. Later the Signal Corps supplemented its communication service with radio installations. Weather observations from several points were collected soon thereafter in a desultory way. Systematic collections began in 1907, the first report by radio being from Nome on November 1.

When the weather service for airways was authorized on July 1, 1930, twice-daily observations were being obtained from 13 places, 4 by Navy radio and 9 by Signal Corps radio. These were transmitted to Seattle and were used in connection with the general weather forecasting work in the States as well as in Alaska. They formed the basis for the first service to aviation in the Territory, but in a few months were supplemented by reports from 19 other localities. Nearly all of the communication service then, as now, was rendered by the Signal Corps.

The participants in the early pioneer flights and development of air travel in Alaska found the Army Signal Corps radio station network of great practical value in the collection and dissemination of information which contributed greatly to the success of each of the flights. Close cooperation was given to the United States Air Service during its initial aerial expedition in 1920, and again during the "round-the-world airplane flight" in 1924. Full cooperation was extended to Amundsen and Ellsworth in 1926 in an endeavor to establish and maintain communication with the expedition while in the vicinity of Alaska. Special arrangements were made for fast communication service during the time Wiley Post was traversing Alaska on his round-the-world flight in 1933. The squadron of 10 Army planes which visited Alaska during July and August 1934 was furnished radio-telegraph and radio-telephone communication by the System during the flight to Alaska and return to the United States. News of the fatal crack-up of the Wiley Post-Will Rogers projected Alaska-Moscow flight was sent out by the Signal Corps operator at Point Barrow.

Growth of Mail Carrying by Airplane

Although strictly air-mail contract routes have not as yet been established in Alaska, the use of airplanes in star route service has expanded rapidly until at the present time about 65 percent of the total cost for this class of service (contract star routes) is expended for service by airplane, almost completely eliminating dog-sled service on the trunk line routes.

The act of August 20, 1937, amending the act of August 24, 1935, will permit the establishment of regular air-mail service in Alaska. It also gives the Postmaster General authority to fix a surcharge on the mails transported when in his discretion such surcharge is warranted. The Post Office Department is now advertising for air-mail service, July 1, 1938–June 30, 1942, on the following routes:

From Cordova to Katalla, 85 miles and back, twice a month from June 1 to September 30, carrying all month from December 1 to February 28, each year, carrying all mail offered; and from Katalla to Cape

Yakataga, 55 miles and back, four times a year, trips to be made in March, June, September, and December each year, the carrier to remain at Cape Yakataga not less than 12 hours when weather conditions permit, carrying not to exceed 300 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Anchorage (or Seward if desired by contractor), by Kenai and Kasilof to Ninilchik, 110 miles and back, twice a month from December 1 to about March 31 (eight round trips) each year, carrying not to exceed 500 pounds of mail a single trip, each way, by a schedule satisfactory to the Department; carrier to remain at least 12 hours at Ninilchik.

From Anchorage to Susitna, 30 miles and back, twice a month from June 1 to September 30, carrying all mail offered, and once a month from October 1 to May 31 each year, carrying 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department; the carrier to remain at Susitna 12 hours each trip.

From Anchorage to Pedro Bay, Iliamna, Igiugig, Naknek, Koggiung, Egegik, and Pilot Point to Ugashik, returning by Clarks Point, Kanakanak, Dillingham, Ekwak, and Iliamna to Anchorage, equal to 467 miles and back, twice a month from about October 15 to May 5 (14 round trips) each year, carrying not to exceed 600 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Cantwell to Denali, 60 miles and back, once a month all the year, carrying not to exceed 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Fairbanks to Livengood, 55 miles and back, once a week all the year, carrying all mail offered, by a schedule satisfactory to the Department.

From Fairbanks by Lake Minchumina (n. o.)*, Medfra, McGrath, Stony River, Sleetmute, Crooked Creek, Napamute, Aniak, Kalskag (n. o.), and Akiak to Bethel, 540 miles and back, once a week from about November 1 to about April 30 (26 round trips) each year, carrying not to exceed 1,200 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From McGrath to Takotna and Ophir to Flat, 99 miles and back, once a week from about November 1 to about April 30 (26 round trips) each year, carrying not to exceed 700 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Bethel by Akiak to Russian Mission, 209 miles and back, once every 2 weeks from the opening of navigation at Bethel, about May 20, to the close of navigation at Russian Mission, about September 30.

* The abbreviation "n. o." indicates the absence of a post office.

each year, carrying not to exceed 1,200 pounds of mail a single trip each way, except the first trip from Bethel in May when first-class letter mail only need be carried, if break-up conditions endanger transportation, by a schedule satisfactory to the Department.

From Bethel by Quinhagak and Good News Bay to Platinum, 136 miles and back, twice a month in June, July, August, and September, and once a month from October to May inclusive (carrier may omit May and October trips if freeze-up and break-up conditions make travel impossible) (16 round trips), each year, carrying not to exceed 500 pounds of mail a single trip each way during the winter season, and all mail offered during the season of navigation, by a schedule satisfactory to the Department.

From Fairbanks to Tanacross to Tetlin, 225 miles and back, once a month all the year, carrying not to exceed 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Fairbanks by Aniak and Bettles (n. o.) to Wiseman, 285 miles and back, once a month from about September 15 to about May 31 (nine round trips) each year, carrying not to exceed 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Fairbanks, by Hot Springs, Tanana, Kokrines, Ruby, Galena (n. o.), Koyukuk, Nulato, and Golovin to Nome, 524 miles and back, twice a week from about November 1 to about May 6 (54 round trips) each year, carrying not to exceed 1,200 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Holy Cross by Russian Mission and Ohogamute to Fortuna Ledge, 126 miles and back, once a month from about November 1 to about April 30 (six round trips) each year, carrying not to exceed 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Flat by Holy Cross to Anvik, 122 miles and back, once every 2 weeks from about November 1 to about April 30 (13 round trips) each year, carrying not to exceed 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Mountain Village to Hooper Bay, 75 miles and back, once a month, all the year, except in May and October (10 round trips), carrying not to exceed 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Unalakleet by Shaktoolik (n. o.), Haycock, Candle, and Deering to Kotzebue, 300 miles and back, twice a month from about November 1 to about May 15 (13 round trips) each year, carrying not to exceed 600 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

From Kotzebue by Kiana, Selawik, and Shungnak (n. o.) to Kobuk, 181 miles and back, once a month from about November 1 to about April 30 (six round trips) each year, carrying not to exceed 500 pounds of mail a single trip each way, by a schedule satisfactory to the Department.

Advertisements for two important air-mail routes in Alaska have been issued by the Post Office Department. These advertisements will close on February 1, 1938. One of these routes is from Juneau, the capital of Alaska, to Whitehorse, Yukon Territory, Canada, a distance of 168 miles. The other is from Fairbanks, the principal business and distributing center in middle northern Alaska, to Whitehorse, a distance of 492 miles.

These routes, connecting at Whitehorse, will afford a through or connecting service from Juneau, in southeastern Alaska, to Fairbanks, from which point several air-mail routes are now operating to distant points in the Territory, among them being the important routes from Fairbanks to Nome, 524 miles, and from Fairbanks to Bethel, 540 miles. The last two routes named and also a great majority of the other routes over which mails are transported by airplane provide for winter service only.

The Juneau-Fairbanks air-mail service will have once-a-week round-trip schedules and will connect at Juneau and with the mail and passenger steamers from Seattle. Under existing land and water transportation services, mail, passengers, and express proceed from Juneau on to Seward by steamer and thence by railroad to Fairbanks. About 5 days are required by steamer and rail to move the mails from Juneau to Fairbanks while the planes will cover the distance between these points in about 4 or 5 hours.

It is hoped, in the near future to establish an air-mail route from Seward via Anchorage, Valdez, and Cordova to Tanacross where it will connect at that point with the Fairbanks-Juneau line. It is also proposed to establish a summer route from Fairbanks via intermediate post offices to Nome, 524 miles, and from Fairbanks via intermediate post offices to Bethel, 540 miles. These two routes in conjunction with the service now authorized will provide a year-round air-mail service from Juneau via Fairbanks to Nome, and from Juneau via Fairbanks to Bethel.

The two routes which are now being advertised between Juneau and Fairbanks are the first leg in a trunk line air-mail route from Fairbanks and Juneau into the United States. It is hoped that within the next year or two a route can be established from some point in the States to connect at Juneau or Whitehorse with the routes now being advertised. Whether this last-mentioned route will be laid out along the

coast from Seattle, Wash., via Ketchikan and Petersburg to Juneau; whether it will be run from Spokane, Wash., back of the coastal mountain range, to Edmonton, Canada, and thence to Whitehorse, or whether it will run from Great Falls, Mont., to Edmonton and Whitehorse, remains to be determined. All of these proposed routes are being considered.

The rapid growth of the air-mail service in Alaska can be seen at a glance at the Summary of Aircraft Operations 1928-37. The poundage of mail has increased from 24,250 pounds for the 2-year period ending March 13, 1929, to 487,630 pounds for the fiscal year 1937.

Growth of Express, Freight, and Passenger Carrying

The summary of aircraft operations which follows clearly indicates the remarkable growth in the carrying of express, freight, and passengers by commercial airlines. The number of planes in operation has increased from 8 to 101 over a 10-year period; passengers from 2,171 in the 2-year period 1928-29 to 20,958 in 1937, and freight and express from 91,701 pounds to 2,940,757 pounds in the same period—truly a remarkable record of progress.

The number of passengers carried has with slight variation increased approximately 30 percent each year over that of the preceding year. In 1937, 20,958 passengers were transported, a figure which becomes significant when compared with the 1930 census of Alaska of approximately 60,000 persons, and still more startling when compared with the number of white persons listed in the same census, numbering only 30,000 in round figures. In the same period on scheduled commercial airlines of continental United States 1,063,480 persons were carried.

Freight and express show even a greater rate of increase, mounting from 9,500 pounds in 1928 and 1929, through 10,000 pounds, 16,000 pounds, 59,000 pounds, 63,000 pounds, 87,000 pounds, 1,500,000 pounds, 2,139,000 pounds in successive years to approximately 3,000,000 pounds in 1937. In 1937 on scheduled commercial airlines in continental United States 7,463,668 pounds were carried. It is believed no elaboration is needed in support of the statistics showing the growth of aviation in the Territory. The table which follows is nevertheless worthy of most careful study.

Further indication of the volume of air traffic in Alaska, showing seasonal trends, is revealed in the accompanying tabulation of air commerce by months for the fiscal year 1937.

On June 30, 1937, there were in Alaska 40 operators with 101 aircraft under United States registry. There are 60 transport pilots licensed for flying in Alaska, 2

Summary of aircraft operations, 1928-37

Year	Number of planes in service	Plane-miles	Passengers carried	Passenger-miles	Mail	Express and freight
2-year period ending—					Pounds	Pounds
Mar. 31, 1929.....	8	331,591	2,171	272,999	24,250	91,701
Fiscal year ending—						
June 30, 1930.....	24	338,422	3,654	684,361	17,690	103,043
June 30, 1931.....	26	381,234	7,947	947,695	.....	116,178
June 30, 1932.....	31	742,854	6,637	942,176	.....	149,680
June 30, 1933.....	42	1,059,155	7,743	1,222,510	151,570	634,016
June 30, 1934.....	56	1,126,610	10,104	1,533,311	124,972	869,398
June 30, 1935.....	73	1,685,654	13,315	2,148,692	225,840	1,496,917
June 30, 1936.....	79	2,130,929	16,982	3,035,018	279,720	2,138,886
June 30, 1937.....	101	2,209,206	20,958	4,021,798	487,630	2,940,757

¹ Includes mail.

Air travel, Territory of Alaska, fiscal year 1937

Month	Flying time	Mileage	Number of passengers	Passenger-miles	Freight and express	Mail
	Hours				Pounds	Pounds
July.....	1,936	219,963	2,325	438,650	275,411	247,000
August.....	2,170	237,026	3,059	514,436	222,147	4,672
September.....	1,888	197,299	1,918	355,919	304,317	4,413
October.....	1,268	143,209	1,550	236,498	264,382	8,637
November.....	1,338	152,385	1,317	355,797	143,126	26,001
December.....	1,146	125,679	1,104	274,498	133,378	34,516
January.....	1,102	117,164	1,001	217,921	130,105	31,809
February.....	1,111	117,647	868	164,430	225,543	33,314
March.....	1,614	167,887	1,438	301,318	262,160	35,824
April.....	2,098	228,678	1,817	347,781	412,715	34,517
May.....	2,010	218,429	1,729	331,688	231,914	19,423
June.....	2,584	283,850	2,832	483,762	335,553	7,504
Total.....	20,265	2,209,206	20,958	4,021,798	2,940,757	487,630

limited commercial pilots, and 3 private pilots. There were 3 scheduled airlines, the Marine Airways with Juneau as a base operating to Sitka, the Intercoastal Airways operating from Ketchikan to Juneau, and the Pacific Alaska Airways operating between Juneau and Fairbanks, to Nome. The 2 largest bases for interior operation are at Anchorage and Fairbanks.

The volume of air traffic indicated by the foregoing discussion and tables was carried on with woefully inadequate ground and navigation facilities. Of the 97 so-called airfields for public use in Alaska in June 30, 1937, only 13 can be said to have more than one runway. This count can be reached only by including such fields as Healy, where the runways measure 250 by 800 feet and 250 by 700 feet, or Lower Tonsina with two runways of 150 by 900 feet each. Only 6 have runways 3,000 feet long or longer. Only 12 have runways of 2,000 to 3,000 feet; 28 have runways 1,500 to 2,000 feet, and 51 have runways less than 1,500 feet in length.

The only surfacing provided is that found at the site, except that in a few instances a small amount of pit-run gravel has been used for fill. None of the fields has any lighting facilities whatever, except Fairbanks and Anchorage, each of which has a rotating beacon and floodlight. There are no public accommodations at any of the airfields except at towns. There are no hangars privately owned where visiting planes

can secure accommodations over night, except two, and the services of these are limited.

Fields have for the most part not been located on air routes fixed by nature and climatic conditions, or fixed by centers of population; rather they have been constructed at points where needed the most in order to move passengers and freight from a central point to a terminating makeshift field. It is not unusual, but customary, to fly as much as 300 miles in a land plane without a single landing field. It is perhaps an exaggeration to say that sand bars and clearings are utilized as often as constructed fields, but the fact remains they are by force of circumstances used all too often.

During the winter months, when snow, ice, and frozen ground improve landing conditions, the extremely short hours of daylight seriously interfere with flying. During the period of the long days the soft melted surface of the ground, particularly in the tundra regions, introduce landing and take-off hazards. Many aircraft, landed safely in emergencies, bog down.

The coastal regions, particularly in southern Alaska, where conditions appear to be favorable for seaplane operations, are subject to heavy fogs and thick weather. Floating ice, logs, and driftwood impose landing hazards.

Appropriations for Weather Service Not Kept Pace

It will be seen that the development of aviation service in Alaska has been very rapid in recent years, and it is to be noted that the meager weather service which was provided for aviation in 1931 has remained static since that time. This situation should be rectified. The lack of an adequate weather service increases the hazards of flying in Alaska and is holding back the proper development of the region. As a partial correction, the Weather Bureau estimates \$38,000 as immediately desirable for putting the weather reporting system in condition for meeting present needs. This increase would improve the existing service but would fall far short of that required for satisfactory operations. A recommended program, which would provide adequate meteorological service for the protection of aviation in Alaska, is given toward the end of this staff report.

Volume of Communications Now Handled by Signal Corps in Connection With Flying

The Alaska Communication System now handles 174 airways weather messages daily and frequently a number of additional messages required by special occasions. Due to absence of Bureau of Air Commerce Airways Service in Alaska, Anchorage and Fairbanks

broadcast weather reports by radiophone twice daily and Nome three times daily.

All told, the Alaska Communication System now consists of 21 radio stations in Alaska with a tie-in to Seattle. A radiotelephone circuit was opened in July 1937 between Juneau, Alaska, and Seattle. This circuit can be connected to the Bell System through the Seattle exchange.

Supervisory Agencies

Taking into consideration these adverse conditions and the fact that no adequate aeronautical charts of Alaska are available, successful operation demands extremely capable management. In the interest of safety the Department of Commerce stationed an aeronautical inspector in Alaska in 1934 and added a second in 1937. Realizing the importance of aviation to Alaska the Territorial legislature by act approved March 11, 1937, provided for an Aeronautics and Communications Commission to "have supervision over aeronautics and communications within the Territory." The act likewise provided for a supervisor of aeronautics and communications, to be appointed by the commission and provided for the establishment of radio stations at Ketchikan, Juneau, Cordova, Anchorage, Fairbanks, and Nome. Cooperation between the Territorial commission and the agencies of the Federal Government interested in the welfare and administration of aviation in the Territory was evinced by a joint meeting in Juneau, Alaska, August 3-7, 1937, resulting in recommendations for:

1. Increased meteorological service.
2. Further mapping.
3. Additional communication facilities.
4. Installation of airways and navigational aids.
5. Construction of landing fields.

The Use of Air Transportation by Federal Agencies

The Army has established no aeronautical activity in Alaska partly because of the lack of ordinary facilities. Although the establishment of one air base with auxiliaries in Alaska was authorized in the Wilcox Air-base Act, approved August 12, 1935 (49 Stat. 610), no operations have yet commenced. The Navy has recently established minor patrol facilities at Sitka.

Manifestly a well-developed airport and airways system will have valuable application to military air operations in a national emergency. All the associated facilities, including particularly weather reports, flying aids of all sorts, availability of fields, and expansion of knowledge and experience of Alaskan topography and flying conditions will be directly useful in meeting any defense requirement that might develop.

This, while it applies to naval aviation only in general terms, except for the projected development along the Alaskan peninsula to Unalaska, applies very forcefully and specifically to Army aviation throughout the southeastern and main portions of Alaska, where the major portion of the airways development proposed herein is commercially needed. Furthermore, in addition to the direct emergency value of such an airways system, available both before and after the development of military aviation facilities, the system will automatically and greatly simplify the Army's and Navy's task of providing adequately for their own future aviation establishments. While the advantage, as in the case of the emergency angle above, will be greater to the Army than to the Navy, the presence of properly developed commercial aviation will be an asset well worth considering, in that military aviation will thus be comparatively free to concentrate its funds and its efforts on its own strictly military requirements, while associated facilities will already be available for them if commercial aviation is properly developed.

The Coast Guard commenced aviation activities in Alaska in June 1937, with one amphibian plane based on board the Coast Guard Cutter *John C. Spencer* at Cordova, Alaska. This plane is used for the protection of life and property and the enforcement of law. The Coast Guard has plans for extending aviation activities in Alaska by assigning two more airplanes during the summer of 1938 to the Coast Guard vessels on duty in Alaska. The expansion of Coast Guard aviation activities in Alaska is dependent to a large degree upon the improvement of facilities, particularly seaplane bases.

Airplanes chartered from commercial companies have been used to a considerable extent in the patrol of fishing grounds in southeast Alaska and the Seward-Katalla district, especially during weekly closed periods. Their use to supplement the vessel patrol is of distinct advantage, as a very large area can be covered in a short time, and fishermen are deterred from illegal operations because they do not know which plane is on patrol nor is there time to adjust their apparatus at the approach of an investigator. Planes have been used also in making inspections of some of the spawning grounds and in transporting officials of the Bureau to isolated districts. During the 1936 season a total of 14,413 nautical miles was traveled in these activities in 46 days, the total flying time amounting to about 143 hours.

The Forest Service could use aircraft very advantageously on the national forests of Alaska, which cover 21,000,000 acres in an 800-mile strip along the southern coast. This forest region comprises the most

populous and most extensively industrialized portion of the Territory and virtually all lines of endeavor in this area involve directly or indirectly the use of national forest land or other forest resources. The Forest Service field work of serving these local interests over this vast area is now carried on by means of motor-launch transportation at a speed of 8 to 10 miles per hour, whereas the private parties and corporations being served are rapidly turning to the use of the airplane. Motor launches are now obsolete for many purposes and more satisfactory administration, it is believed, could be effected by the use of air transportation.

The Office of Indian Affairs in its administration of its educational, medical, and welfare activities for the natives of Alaska must rely greatly upon air transportation for movement of personnel and emergency supplies, transportation of patients and supervisory officials. The activities of the Bureau extend the width and breadth of the Territory and are in maximum operation during the winter months. To date the Bureau has used only commercial planes.

Likewise the Department of Justice, as well as other branches of the Government, in the exercise of their duties in the Territory find the airplane indispensable.

Mapping activities of various governmental services can be greatly facilitated by aerial photography which, if properly interwoven with ground mapping and investigations, can be of utmost value. Mapping, cover crop and soil investigations, land use studies, and mineral development can be accelerated by aerial photography and the cost of such activities materially reduced.

There follows a list of airfields in Alaska with their dimensions, compiled June 30, 1937, an asterisk marking bases from which one or more planes operate.

Name of field	Dimensions
1. American Creek	250 by 750 feet.
2. Anchorage	400 by 2,000 feet, 400 by 3,200 feet.
3. Bear Creek	150 by 800 feet.
4. Bethel	200 by 2,500 feet, 200 by 2,000 feet.
5. Big Delta	200 by 2,000 feet.
6. Baldwin (private)	100 by 1,100 feet.
7. Bettles River	250 by 600 feet.
8. Bluff	400 by 900 feet.
9. Brooks (Livengood)	200 by 1,600 feet.
10. Bremner	170 by 800 feet.
11. Cache Creek	100 by 900 feet.
12. Candle	150 by 1,500 feet.
13. Cantwell	200 by 1,000 feet.
14. Cape Prince of Wales	250 by 1,000 feet.
15. Caribou	100 by 1,800 feet.
16. Chena Hot Springs	300 by 500 feet.
17. Chicken	125 by 1,500 feet.
18. Chisana	150 by 1,000 feet.
19. Chistochina	250 by 1,700 feet.
20. Circle Hot Springs	400 by 2,100 feet.
21. Clearwater	No dimensions available.
22. Coffee Creek	125 by 1,000 feet.
23. Colorado Station	150 by 1,700 feet.

<i>Name of field</i>	<i>Dimensions</i>	<i>Name of field</i>	<i>Dimensions</i>
24. Copper Center.....	150 to 350 by 1,400 feet.	83. Sitka.....	Small landing floats but no public ramp.
25. Cordova.....	200 by 2,000 feet.	84. Skagway.....	300 by 1,960 feet.
26. Council.....	150 by 1,500 feet.	85. Do.....	Small landing floats but no public ramp.
27. Cripple Creek.....	125 by 1,800 feet.	86. Solomon (Beach land- ing).	235 by 5,200 feet.
28. Curry.....	200 by 1,100 feet.	87. Slate Creek (private field).	150 by 1,700 feet.
29. Deering.....	150 by 2,000 feet.	88. Squirrel River (private field).	150 by 1,200 feet.
30. Donnelley.....	300 by 1,200 feet.	89. Stuyahok.....	120 by 1,100 feet.
31. Eagle.....	350 by 1,600 feet.	90. Susitna Station.....	225 by 1,500 feet.
32. Eureka.....	180 by 1,150 feet.	91. Takotna.....	300 by 1,300 feet.
33. Fairbanks.....	400 by 2,100 feet, 400 by 1,900 feet.	92. Talkeetna.....	150 by 1,500 feet.
34. Flat*.....	150 by 1,950 feet.	93. Tanana.....	300 by 1,400 feet.
35. Fort Yukon.....	250 by 1,400 feet, 150 by 800 feet.	94. Tanana Crossing.....	200 by 2,000 feet, 500 feet extra.
36. Franklin.....	120 by 1,200 feet.	95. Taylor Creek.....	100 to 150 by 1,800 feet.
37. Gakona (private).....	300 by 1,500 feet.	96. Teller.....	300 by 1,250 feet, 250 by 1,400 feet.
38. Ganes Creek.....	100 by 1,500 feet.	97. Thompson Pass.....	100 by 1,000 feet.
39. Golovin.....	100 by 1,700 feet.	98. Unalakleet.....	200 by 1,500 feet, 250 by 1,500 feet.
40. Goodnews Bay.....	400 by 3,000 feet.	99. Upper Jack Wade.....	110 by 1,100 feet.
41. Hazycock.....	150 by 1,400 feet.	100. Upper Tonsina.....	250 by 1,000 feet.
42. Healy.....	250 by 800 feet, 250 by 700 feet.	101. Tin City.....	150 by 1,000 feet.
43. Jack Wade.....	150 by 1,400 feet.	102. Valdez.....	200 by 1,600 feet, 200 by 2,500 feet.
44. Juneau (private).....	200 by 2,000 feet.	103. Valdez Creek.....	125 by 900 feet.
45. Kaltag (east side Yukon).	250 by 2,000 feet.	104. Walkers Fork.....	130 by 1,200 feet.
46. Kenai.....	200 by 1,200 feet.	105. Wasilla.....	200 by 1,000 feet.
47. Ketchikan.....	Small landing floats but no public ramp.	106. Willow Creek (private field).	240 by 1,200 feet.
48. Kivalina.....	200 by 5,000 feet.	107. Willow Creek Mines (Lucky Shot).	130 by 1,500 feet.
49. Kiwalik.....	250 by 1,600 feet.	108. Willow Station (private field).	150 by 1,100 feet.
50. Kobuk.....	240 by 1,300 feet.	109. Wiseman.....	400 by 1,400 feet.
51. Kotzebue.....	180 by 1,200 feet, 195 by 720 feet.	*Bases from which one or more planes operate.	
52. Koyuk.....	280 by 1,600 feet.	The fields included in the foregoing table have for the most part been constructed from Territorial funds. Expenditures and unexpended allotments of the Federal Government to date total only \$209,087. Yet the importance of Alaska aviation is well demonstrated. The industries of the Territory, fishing and mining, the fur industry, commercial activities, direct activities of the Federal Government, provisions for the health, education, and welfare of the natives of Alaska, aerial mapping, law enforcement, supervision of the fisheries, wildlife and forest resources, activities of the Coast Guard, and national defense are all directly influenced.	
53. Lost River.....	250 by 1,250 feet.		
54. Lower Kougarak.....	125 by 1,100 feet.	The Federal Government has expended during the last 10 years, 1928-37, on construction and maintenance of roads in Alaska approximately \$16,000,000, and since the beginning of construction on the Alaska Railroad about \$73,000,000 on railroads, both essential to the development of the Territory and amply justified by their influence upon such development. The services of these transportation facilities are of greatest value however to the areas immediately adjacent to their routes. When the Alaska situation is reviewed,	
55. Lower Tonsina.....	150 by 900 feet, 150 by 900 feet.		
56. Manley Hot Springs.....	200 by 2,100 feet.		
57. May Creek.....	150 by 1,500 feet.		
58. McCarthy.....	300 by 1,164 feet, 191 by 2,167 feet.		
59. McGrath.....	200 by 1,600 feet.		
60. McKinley Park (Private).	100 by 700 feet.		
61. Medfra.....	200 by 1,500 feet.		
62. Moore Creek.....	No dimensions available.		
63. Moose Creek.....	200 by 1,000 feet.		
64. Moses Point.....	200 by 1,500 feet.		
65. Nabesna.....	200 by 900 feet.		
66. Nebana.....	200 by 900 feet.		
67. Ninilchik (winter).....	240 by 1,335 feet.		
68. Nome.....	200 by 3,200 feet.		
69. Noorvik.....	150 by 1,500 feet.		
70. Nulato.....	110 by 2,000 feet.		
71. Omega Creek.....	230 by 900 feet.		
72. Ophir.....	200 by 800 feet.		
73. Palmer Creek.....	200 by 800 feet.		
74. Petersburg.....	Small landing floats but no public ramp.		
75. Peters Creek.....	125 by 1,100 feet.		
76. Pilgrim Hot Springs.....	200 by 1,200 feet.		
77. Point Hope.....	200 by 3,000 feet.		
78. Ruby.....	200 by 1,600 feet, 150 by 2,000 feet.		
79. Salmon River.....	150 by 1,500 feet.		
80. Savage River.....	250 by 1,200 feet.		
81. Selawik.....	100 by 1,000 feet.		
82. Seward.....	200 by 1,900 feet, 200 by 1,000 feet.		

the flexibility of air transportation is a most important factor. The improvement of operating conditions will not only benefit areas not now served by surface transportation but will prove to be an important adjunct to water, road, and railway facilities, thus widening the area reached by them and stimulating traffic over them.

Recommendations

In order to remove the shortcomings of the present facilities serving air traffic a four-point remedial program is proposed covering (1) meteorological aids, (2) aeronautical charts, (3) communication facilities and navigational aids, (4) airfield construction.

Weather Service Extension Requirements

Meteorological protection is most important as an aid for the safety of aviation in Alaska. All Bureau of Air Commerce, Signal Corps, and Navy stations should be completely equipped with meteorological instruments and all untrained personnel should be given instruction by the Weather Bureau in taking observations. In addition, it would be necessary for the Weather Bureau to establish on-call and 6-hourly weather reporting stations at intermediate points along airways and at points off the airways in order to have an adequate network for the preparation of four weather maps a day. Upper-air observations, with pilot balloon runs every 6 hours, are required at 11 points along airways and radiometeorographic observations taken once a day, are required at four points to give adequate coverage. It would be the responsibility of the Weather Bureau to coordinate this service among the observing agencies and to arrange a system through which reports would be collected at four important air terminals. At these points, it would be necessary for the Weather Bureau to establish 6-hourly map and forecast centers, where advice to aviation interests would be issued.

The weather service required for aviation will, in a large measure, provide the basic information for service to other commercial activities in Alaska. In the staff report on Meteorology and Climatology, an outline of complete meteorological service for all activities is given but in order that the service for aviation may be visualized as an essential complement of other aids to air navigation, it is listed hereunder by omitting items pertaining to other commercial requirements.

Aeronautical, Weather Reporting, and Forecasting System

1. District and airway forecast center, radiometeorographic, including increased work for all commercial activities:

Juneau.
Fairbanks.
Anchorage.
Nome.

2. First-order upper-air stations:

Bethel.
Point Barrow.
Boundary.
Cordova.
Ketchikan.
Ruby.
Rainy Pass.

3. Second-order and 6-hourly airway stations, including instruments for Signal Corps, Navy, and Bureau of Air Commerce stations:

Aniak.
Annex Creek.
Big Delta.
Broad Pass.
Cantwell.
Cape Hinchinbrook.
Cape St. Elias.
Chatanika.
Chiguik.
Chitina.
Circle Hot Springs.
Cleary Summit.
Copper Center.
Curry.
Deering.
Dillingham.
Eagle.
Egegik.
Farewell Mountain.
Five Finger Light.
Flat.
Fort Yukon.
Gambell.
Good News Bay.
Guard Island.
Haines.
Healy.
Hydaburg.
Hyder.
Iliamna.
Jack Wade.
Kake.
Kanakanak.
Kodiak.
Koggiung.
Kolzebue.
Koyuk.
Koyukuk.
Lake Minchumina.
Lucky Shot.
McCarty.

McGrath.
McKinley.
Medfra.
Mountain Climber.
Nabesna.
No Grub.
Nulato.
Ohogamute.
Paxson.
Petersburg.
Pilot Point.
Platinum.
Point Hope.
Port Alexander.
Rapids.
Seldovia.
Selawik.
Sentinel Island.
Seward.
Shungnak.
Skagway.
Sitka.
Skwentna.
Slana.
Soapstone Point.
Stevens Village.

Taku Pass.
Talkeetna.
Tanana.
Tanana Crossing.
Teikel.
Teflin.
Unalaska.
Unalakleet.
Unga.
Valdez.
Wiseman.
Wrangell.
Yakataga Beach.
Yakutat.

Aeronautical Charts

It is essential that accurate aeronautical charts be made available immediately, not only to meet the requirements of the anticipated increase in the use of aircraft in Alaska, but for present, immediate use. A series of such charts has been programmed by the Coast and Geodetic Survey, which will be in a position to proceed with the work immediately if funds are made available for the purpose. The Bureau of

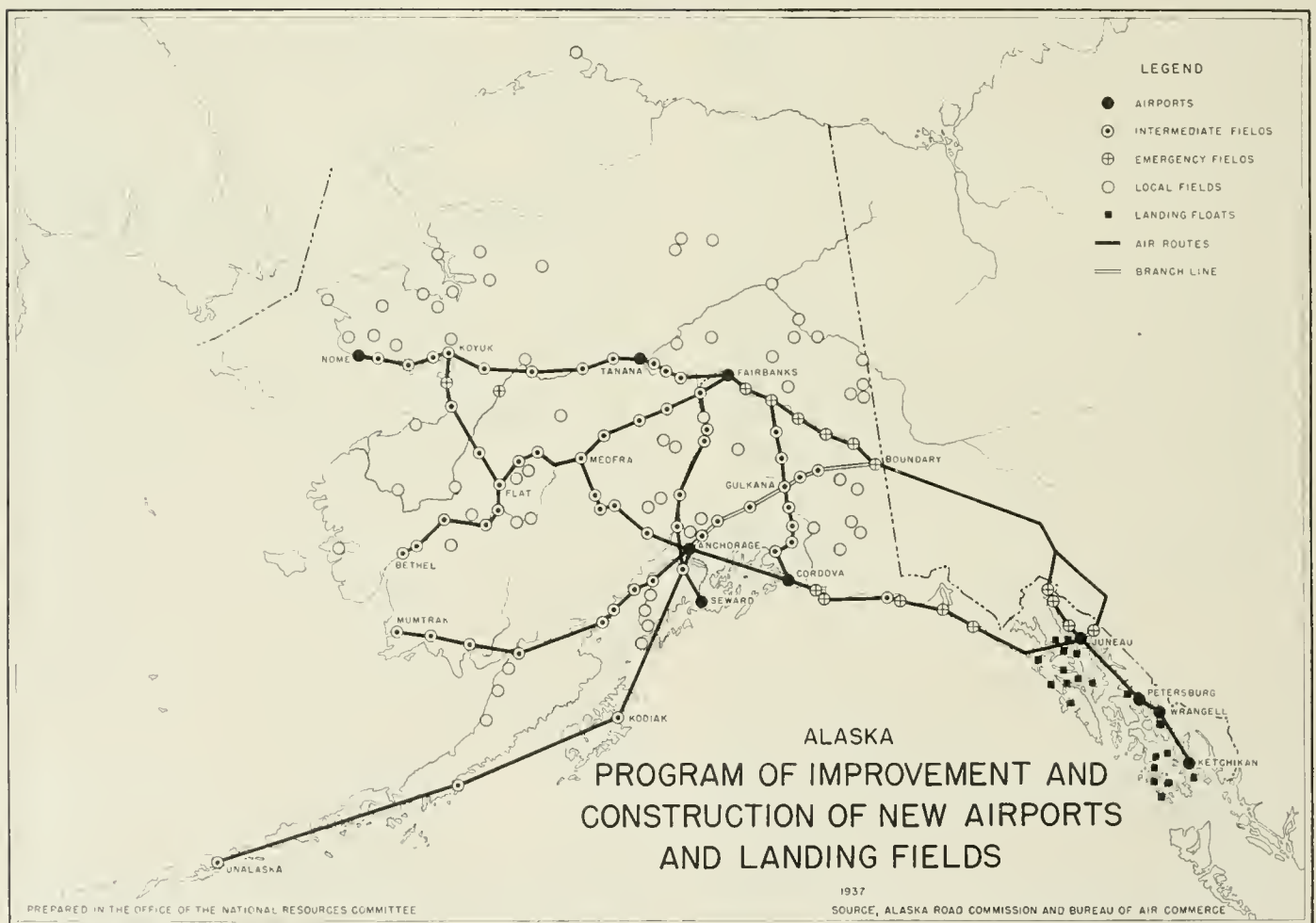


FIGURE 38

Air Commerce is insistent that this program be started at the very earliest opportunity, not only because of its importance in the safe operation of aircraft, but it is essential in properly planning and installing a system of air navigation facilities.

The program, as planned, includes eight charts, scale of 1:1,000,000, covering southeast Alaska, the area of Alaska adjacent to the Gulf of Alaska and the Alaska Peninsula, and the Aleutian Islands; also a series of three charts, scale of 1:1,500,000, for the northern and central portions of the Territory. This program has the approval of the Bureau of Air Commerce as being essential and satisfactory for the commercial development of the air transportation industry and also the endorsement of representatives of the War and Navy Departments as satisfactory for military use.

Navigation and Communication System

The following is an initial and somewhat skeletonized system which would meet the immediate and estimated near future requirements for safeguarding and regularizing air transportation on the following trunk and principal secondary routes. It is not a complete and final airways system.

Airways

1. Ketchikan-Nome:

Radio range and communication stations:

Ketchikan.
Juneau.
Boundary.
Tanana Crossing.
Ruby.
Fairbanks.
Nome.

Radio communications stations:

Wrangell.
Petersburg.
Skagway.
Big Delta.
Tanana.
Sitka.

2. Juneau-Anchorage:

Radio range and communication stations:

Yakutat.
Cordova.
Anchorage.

Radio communication station:

Yakataga.

3. Seward-Fairbanks:

Radio communication stations:

Seward.
Talkeetna.
Cantwell.

4. Bethel-Fairbanks:

Radio range and communication stations:

Bethel.
McGrath.

Radio communication stations:

Flat.
Lake Minchumina.

5. Anchorage-Good News Bay:

Radio range and communication stations:

Dillingham.
Good News Bay.

Radio communication station:

Iliamna.

6. Anchorage-Unalaska:

Radio range and communication stations:

Kodiak.
Chignik.
Unalaska.

7. Cordova-Fairbanks:

Radio communication stations:

Valdez.
Copper Center.

8. Anchorage-Nome:

Radio communication stations:

Unalakleet.
Farewell.

9. Individual Stations:

Radio range and communication station:

Kotzebue.

Radio communication stations:

Deering.
Wiseman.

Landing Field Construction

The more pressing construction requirements to correct the present inadequacies in landing field facilities are included in the following tabulation. The list of proposed landing fields has been compiled upon the basis of the requirements for air transportation as it has now become developed in the Territory. The program of construction of mapping, of meteorological services, and of navigational aids has been coordinated to a corresponding degree of safety and utility. Needless to say improvement in any one of these four fields will be of direct benefit to air commerce, but it is believed the maximum benefit will obtain by a uniform advance upon the problem in each of these fields.

Ketchikan-Nome Route

Airports: Ketchikan, Wrangell, Juneau, Petersburg, Fairbanks, Tanana, Nome.

Intermediate fields: Tolovana, Manley Hot Springs, American Creek, Birches, Kokrines, Galina, Portage, Koyuk, Moses Point, Golovin, Solomon.

Emergency fields: Taku, Berners Bay, Haines, Skagway, Boundary, Tanana Crossing, Tetlin, Johnson River, Big Delta, Lake Harding, Kaltag, Unalakleet, Shaktoolik.

Local fields served: Baldwin, Bettles River, Candle, Chandalar, Chicken, Circle, Circle Hot Springs, Council, Deering, Eagle, Fort Yukon, Goodpaster, Gold Run, Haycock, Jack Wade, Kobuk, Kotzebue, Koyukuk, Livengood, Nabesna, Palmer Creek, Pilgrim Springs, Point Barrow, Poorman, Rampart, Selawik, Squirrel River, Steel Creek, St. Michael, Taylor, Tin City, Wiseman, Woodchopper.

Landing floats, southeastern Alaska: Ketchikan, Wrangell, Petersburg, Chatham, Chichagoff, Craig, Excursion Inlet, Funter Bay, Hawk Inlet, Hood Bay, Hoonah, Hydaburg, Klawock, Port Althrop, Rose Inlet, Scow Arm, Sitka, Tenakee, Todd, Waterfall.

Branch line, Boundary-Anchorage: Slana, Chistochina, Gul kana, Nelchina, Chickaloon, Palmer.

Juneau-Anchorage Route

Airports: Cordova, Anchorage.

Intermediate fields: Yakataga.

Emergency fields: Strawberry Point, Dry Bay, Icy Bay, Katella, Yakutat.

Seward-Fairbanks Route

Airports: Seward.

Intermediate fields: Stetlers Ranch, Willow Station, Talkeetna, Cantwell, McKinley Station.

Local fields: Cache Creek, Copper Mountain, Healy, Lucky Shot, Peters Creek, Valdez Creek, Wasilla, Wonder Lake.

Fairbanks-Bethel Route

Intermediate fields: Nenana, Kantishna River, Lake Minchumina, North Fork, Medfra, Crooked Creek, Napaimut, Kalshak, Akiak.

Local fields served: Aniak, Barnharts, Bear Creek, Ganes Creek, Holy Cross, Nelson Island, Marshall, Reindeer, Sleetmute.

Anchorage-Good News Bay Route

Intermediate fields: Kenai, Kalgin Island, Chinitna Bay, Iliamna, Kogiung, Dillingham, Togiak, Mumtrak.

Local fields: Egegik, Homer, Kasilof, Naknek, Ninilchik, Seldovia, Ugashik.

Anchorage-Unalaska Route

Intermediate fields: Kodiak, Chignik, Unalaska.

Cordova-Fairbanks Route

Intermediate fields: Thompson Pass, Upper Tonsina, Copper Center, Paxsons, Donnelly, Valdez.

Anchorage-Nome Route

Intermediate fields: Susitna, Mountain Climber, Rainy Pass, Farewell, Ophir, Dishna, Flat, Dementi, Unalakleet.

Individual Local Fields

Local fields: Bremner, Chisana, Chitina, May Creek, McCarthy.

There are only three railroads operating in Alaska of interest to the general shipping or traveling public; the Alaska Railroad, main line Seward to Fairbanks; the Copper River and Northwestern, Cordova to Kennecott; and The White Pass and Yukon, which starts at Skagway and traverses 20.4 miles of Alaskan territory en route to Whitehorse, Yukon Territory. The Copper River and Northwestern is reported to be preparing to discontinue operations. The Alaska Railroad with 470.3 miles of main line, will then be the only railroad effectively ministering to the commercial transportation needs of a territory one-fifth the size of continental United States. No new construction in the immediate future is anticipated.

Early Development of Railroads in Alaska

The first evidence of the national interest in railway construction in Alaska is found in a bill referred to the Committee on Foreign Relations, March 17, 1884, "to facilitate the settlement and develop the resources of the Territory of Alaska, and open an overland commercial route between the United States, Asiatic Russia and Japan." The Department of the Interior reporting on the bill stated, "The information on record bearing on the question does not indicate any greater obstacles to the construction of such a line than those already overcome in transeontinental railroad building * * *," but the bill evidently died in Committee.

Undoubtedly the Committee, taking cognizance of the fact that Alaska's total population was reported in 1880 to be approximately 33,500 of which perhaps no more than 4,500 were white, also of the fact that the interior of Alaska was guarded by a series of formidable mountain ranges and as well as of the fact that the Territory was served by some 26,000 miles of coast line and a number of navigable rivers, concluded that the main commerce of Alaska was destined during the formative years to be water borne.

At any rate, it appears no further consideration of a definite nature was paid railroad construction in Alaska until after the gold-rush days of the late 90's, during which it is reported more than 30,000 tons of freight were carried to the stampede areas at an estimated cost of \$15,000,000 to \$16,000,000, and that an

equal amount of freight reached its destination by circuitous river routes. This gold activity doubled Alaska's total population and increased the white population from 4,298 in 1890 to 30,493 in 1900.

Spurred, no doubt, by several requests for private railway franchises, Congress on May 14, 1898, passed an act providing for rights-of-way and other matters pertaining to railroad construction in the Territory. Immediately thereafter, September 1897-March 1899, 11 companies filed applications totaling some 670 miles of road. Between 1898 and 1901, the first of the 3 lines now remaining in Alaska, was constructed from Skagway to Whitehorse, 111 miles in all, slightly more than 20 in Alaskan territory. Previous rates of \$0.30 to \$1.00 per pound were reduced to 4¾ cents by rail. The Copper River and Northwestern was constructed in 1906-11. During this period there was constant agitation to secure Federal aid in some form for railroad activities in Alaska. Subsidies, exclusive grants, and guarantees of interest were proposed. No aid being forthcoming, several of the companies faced bankruptcy even though transportation rates were extremely high. In 1909 it is reported the total transportation charge in the Territory was approximately one-half the value of the gold output, or approximately \$350 per capita.

Preliminary Studies, Alaska Railroad

In 1908, the Governor of Alaska suggested a Federal Commission to study the feasibility of a Federal Railroad and finally after many hearings on land policy, mineral resources, disposal of coal lands and allied subjects, Congress in granting Territorial Government to Alaska, in August 1912, provided for the establishment of the Alaska Railroad Commission.

Pursuant to this act, President Taft appointed Maj. Jay J. Morrow, chairman; Alfred H. Brooks, geologist in charge of Division of Alaskan Mineral Resources, Geological Survey, vice chairman; Civil Engineer Leonard M. Cox, United States Navy; and Colin M. Ingersoll, consulting railroad engineer, of New York City, to examine into certain problems relating to transportation in Alaska. The Commission proceeded to Alaska, and later submitted a comprehensive report, which was transmitted by President Taft to Congress in February 1913.

The Commission reported in brief:

1. That railway connections with open ports on the Pacific were necessary for utilization of the fertile regions of the Alaska interior and the mineral resources and to open up a large region to the homesteader, the prospector, and the miner.

¹ Prepared by Paul W. Gordon, Division of Territories and Island Possessions. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the author.

2. That construction of two independent railroad systems was advisable to be ultimately connected and supplemented as future conditions made necessary, one to run from Cordova by way of Chitina to Fairbanks and the other from Seward around Cook Inlet to the Iditarod River, with a total cost of \$35,000,000 for the 733 miles of new construction involved.

3. That assuming the necessity of earning 6 percent on the capital invested the road could be operated without loss on the estimated available traffic, at a passenger rate of 7 cents per mile and an average freight rate of 8 cents per ton-mile.

4. That an average freight rate exceeding 5 cents per ton-mile and passenger rate in excess of 6 cents per mile would defeat the immediate object of the railroad, namely, the expeditious development of the interior of Alaska and, furthermore, would introduce the question as to whether or not the Seattle-Cordova-Fairbanks freight route would be able to compete with the present all-water route via the Yukon River system, except on shipments in which the time element is of such importance as to warrant the payment of a higher freight rate.

5. That the annual expenditures of the road could be reduced materially if capital could be secured at the lower rates of interest obtainable under a Government guaranty of principal and interest on bonded indebtedness or if the road were constructed by the Government itself.

6. That although this railroad development should be undertaken at once and prosecuted with vigor, the project was not feasible without some plan which would provide for low transportation rates and the consequent rapid settlement of this new land and the utilization of its great resources.

Construction Period

In March 1914 a second act was passed which authorized and directed the President to designate and cause to be located, routes for railroad lines in the Territory of Alaska, to be located so as to connect one or more of the open harbors on the southern coast of Alaska with the navigable waters, coal fields, and agriculture lands of the interior. A new commission was created by President Wilson, to be known as the Alaskan Engineering Commission, to which he appointed three engineers, William C. Edes, of the Southern Pacific Railroad, chairman, Lt. Frederick Mears of the United States Army, and Thomas Riggs, Jr., of the Alaska Boundary Survey Commission. After organizing and equipping a number of railroad location surveying parties, the members of the Commission proceeded to Alaska and made a close examination and survey of the several recommended railroad routes. This work was carried on during the summer and fall of 1914. Detailed estimates and maps were prepared. The information obtained was duly reported to President Wilson, who issued an order in April 1915, which announced his selection of a route commencing at Seward, on Resurrection Bay, and extending northward a distance of 412 miles, more or less, to a point on the Tanana River, where the town of Nenana is now located, with a branch line of 38 miles to the

Matanuska coal field. Subsequently, it was decided to extend the construction of the main line to Fairbanks. Construction of the railroad was begun at once and carried on continuously until a golden spike, signifying completion, was driven by President Harding at North Nenana on July 15, 1923. The railroad thus became one of the significant steps taken by the Federal Government toward the development of the interior of Alaska.

Route

The main line extends from Seward to Fairbanks, 470.3 miles, and includes a railroad purchased, the Alaska Northern, a standard gage line 71 miles long extending from Seward to Kern Creek. The Tanana Valley Railroad, a narrow gage line about 39 miles long, extending from Fairbanks northward through a mining district to Chatanika, was also purchased. Both of these roads were rehabilitated and partly reconstructed, under supervision of the Alaska Engineering Commission. A branch line was also constructed from Matanuska to Chickaloon 37.9 miles long and later the following branches leading to bituminous coal mines were built from this branch line; from Sutton to Jonesville 2.9 miles; from Sutton to Eska 2.4 miles; from Moose Creek to Premier 3.8 miles. Because of limited traffic, operation of the narrow gage line, Fairbanks to Chatanika, was discontinued in August 1930 and the rails were subsequently removed. This district is adequately served by trucks and passenger cars operating on the Steese Highway. During the summer of 1933, the Matanuska branch track was taken up between Sutton and Chickaloon, 17.9 miles. Up to June 30, 1937, the Government had expended for the purposes of the railroad about \$73,500,000, including construction of telegraph and telephone lines, wharves, hospitals, townsites and dwellings for employees, and for the operating expenses in excess of revenues.

Organization and Personnel

Under authority delegated by the President of the United States, all the railroad affairs are conducted under supervision of the Secretary of the Interior; a General Manager is in immediate charge, with headquarters at Anchorage, Alaska. The principal departments of the railroad at headquarters are: maintenance of way; transportation, including telegraph and telephone; mechanical; stores; accounting and disbursing; and hospital. In the continental United States, the railroad is represented by a purchasing agent and office manager, with headquarters at Seattle, Wash., and an assistant general manager in charge of general freight, passenger and immigration business with headquarters at Chicago, Ill.

The average number of employees in 1937 was 802, an increase of 11 over the previous year. The payroll amounted to \$1,632,503.66, an increase of \$60,049.41 over the preceding year. This increase is largely attributable to the operation of the annual leave act of March 4, 1936, which affects practically all employees of the railroad. Following is a tabulation of the average number of employees with salary totals for the years 1923–37.

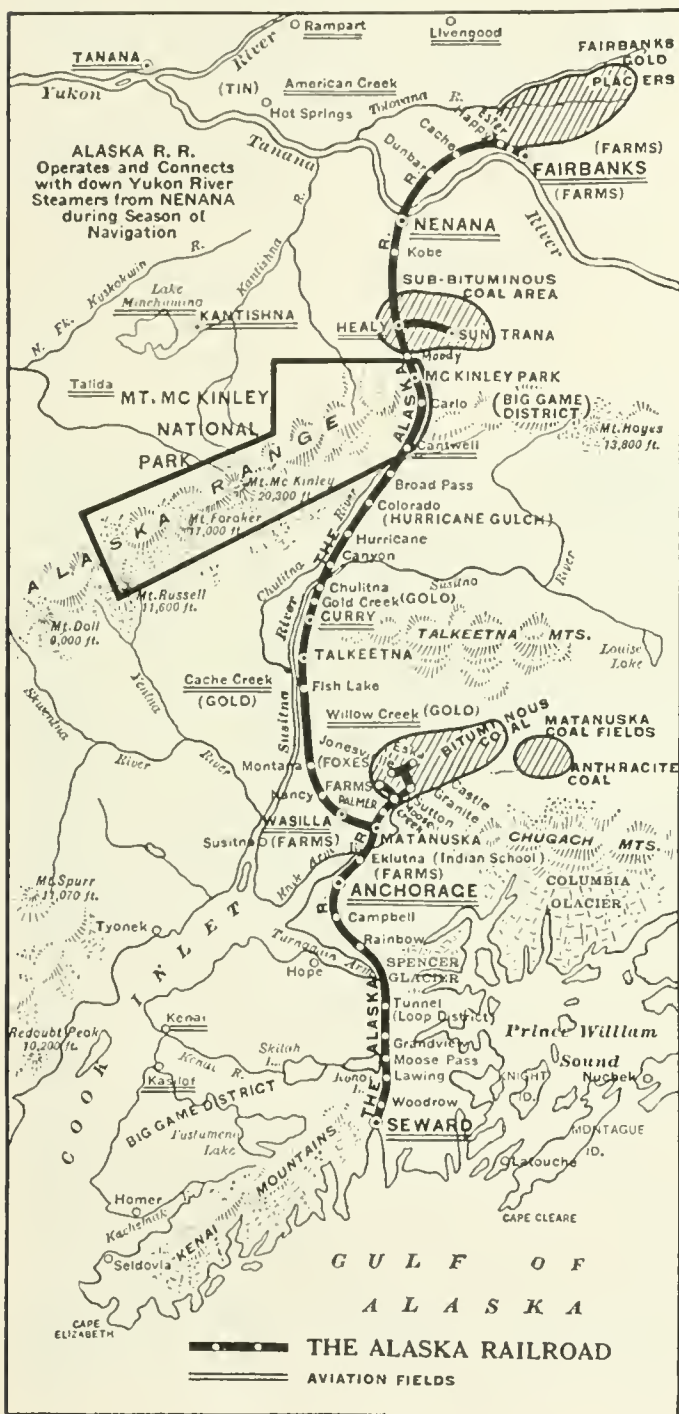


FIGURE 39

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Fiscal year	Average number employed	Salary payments	Fiscal year	Average number employed	Salary payments
1923.....	1,642	\$3,106,741.57	1931.....	671	\$1,420,081.92
1924.....	1,056	2,498,430.91	1932.....	679	1,431,428.80
1925.....	981	2,051,026.75	1933.....	650	1,165,464.07
1926.....	980	1,914,548.00	1934.....	713	1,242,700.40
1927.....	953	1,856,600.00	1935.....	704	1,338,825.27
1928.....	931	1,826,466.36	1936.....	791	1,572,454.25
1929.....	880	1,746,381.59	1937.....	802	1,632,503.66
1930.....	969	1,977,866.88			

Provisions for Employees

As indicated above, employees are subject to the annual leave act of March 4, 1936. They likewise receive certain sick benefits and citizens of the United States are covered by a retirement plan enacted June 29, 1936 (Public 836, 74th Cong.), similar to that provided for the Panama Railroad. Clerical employees, however, are subject to the Civil Service Retirement Act. Wages are based upon those of the short lines of northwestern United States plus a differential of approximately 25 percent in view of the increased costs of living in Alaska. In 1937 employees were hospitalized at the Anchorage base hospital for 2,475 patient days, compared with 1,912 days in 1936. Employees injured during the course of their employment totaled 279, of which number 118 resulted in no loss of time, 30 in loss of time less than 3 days, 86 in loss of time of 3 days or over and less than 30 days, and 45 in loss of time 30 days or over. Payment on account of beneficiaries under Employees' Compensation Act during the year amounted to \$17,001.59; of this amount, \$35,053.88 was paid directly to beneficiaries in cases arising prior to July 1, 1936, and \$10,015.52 to beneficiaries in cases arising during the fiscal year 1937. Miscellaneous expenses to beneficiaries totaled \$1,932.19.

Scope of Activities and Services

Under the general authority of the act of 1914, town sites have been located, mineral resources investigated, agriculture promoted, tourist trade developed, a hotel and a hospital maintained, river transportation on the Yukon (Nenana to Marshall) 858 miles provided, coast-wise vessels during the maritime strike of the winter of 1936–37 operated, public telegraph and telephone lines as well as other public utilities erected.

Both freight and passenger traffic on the railroad are greater during the summer months than during the winter. The arrival of steamers from Seattle and from Alaska Peninsula points is more frequent and industrial activity along the Alaska Railroad more pronounced. Ordinarily the summer services rendered consist of a round trip passenger schedule between Seward and Fairbanks three times per week with supplementary service out of Seward to Anchorage and

Palmer; mixed train service between Anchorage and Matanuska branch line points daily in the peak season; freight-train service between Seward and Fairbanks weekly or biweekly depending upon the volume of traffic; special passenger trains and extra freight trains when demanded by the traffic; river steamer service from Nenana to Marshall every 2 weeks, with additional trips to way stations on the river.

During the winter months, boat service on the Yukon is suspended, and passenger and freight schedules on the railroad reduced to conform to the volume of business and the less frequent arrivals of connecting steamers at the Seward terminus.

During the winter of 1936 because of the maritime strike on the west coast which caused a shortage of necessary commodities in the Territory, the Alaska Railroad under authority of Executive Order issued November 17 operated steamer service between Alaska and Seattle. This service was discontinued upon the termination of the strike. The strike thus reducing

shipments to Seward, resulted in further reducing the railroad schedule below that ordinarily maintained during the winter months.

Operations 1923-37

A more comprehensive review of the operations of the railroad may be gained from the accompanying statement of operations for the years 1923-37.

It will thus be seen that the Alaska Railroad has operated without any sustained interruption since its completion and that the deficits during the early years of its operations have been reduced so that the operating activities of the railroad in 1937 (eliminating operating costs of ocean-going vessels) resulted in a profit of \$2,522.02. It should also be said that during the year the railroad expended \$7,448.99 from a sum of \$250,000 provided in the appropriation act of 1932 for the investigation of mineral resources of Alaska which affect railroad tonnage. If we consider this item outside the normal operation of the railroad the profit



FIGURE 40.—Snow fleet in action at Broad Pass

THE ALASKA RAILROAD

Operating statement—1923 to 1937

Fiscal year	Freight revenue	Passenger revenue	Miscellaneous revenue	Total revenue	Operating expenses	Deficit
1923	\$358,954.43	\$154,710.17	\$404,955.26	\$918,619.86	\$2,069,525.37	\$1,150,905.51
1924	433,174.00	169,139.00	396,174.00	998,487.00	2,737,760.00	1,739,273.00
1925	432,171.31	188,224.77	237,347.35	857,703.43	2,432,812.51	1,575,109.08
1926	592,638.51	220,477.31	257,082.35	1,070,198.17	2,088,058.39	1,017,860.22
1927	841,313.81	224,599.27	272,941.78	1,338,854.86	2,178,279.44	839,424.58
1928	927,943.54	240,046.27	281,834.14	1,449,823.95	2,248,019.81	798,095.86
1929	722,323.83	230,551.16	316,759.00	1,269,634.07	2,186,233.28	916,599.21
1930	719,410.42	214,944.12	252,196.87	1,186,551.41	2,399,707.19	1,213,155.78
1931	739,566.41	206,238.26	206,492.52	1,143,297.22	1,729,771.46	577,474.24
1932	949,937.64	203,848.18	180,504.40	1,334,290.28	1,735,414.20	401,123.92
1933	927,075.25	128,913.25	157,300.43	1,213,318.93	1,470,402.66	257,083.73
1934	1,009,357.32	124,197.31	157,334.18	1,290,888.81	1,469,562.14	178,673.33
1935	1,140,120.51	171,596.50	160,298.25	1,471,015.26	1,548,689.92	73,674.66
1936	1,389,160.34	241,028.21	235,586.77	1,865,775.32	1,883,219.21	17,443.89
1937	1,513,904.56	205,286.47	441,904.38	2,161,095.41	2,333,161.31	172,065.90

¹ Includes \$174,588 loss incurred in the operation of ocean-going vessels during the period of the maritime strike, winter of 1936-37.

Fiscal year	Freight tons		Revenue passengers		Freight ton miles	Passenger miles
	Railroad	River boats	Railroad	River boats		
1923	56,173	3,625	44,490	552	9,069,623	2,822,576
1924	59,532	3,543	49,465	792	9,500,036	2,997,276
1925	53,865	3,125	49,300	833	8,457,351	2,993,550
1926	65,036	3,610	57,567	849	12,455,177	3,505,717
1927	82,416	3,366	53,609	721	16,939,211	3,628,300
1928	96,977	3,825	51,587	872	19,712,037	3,859,509
1929	91,123	3,730	53,177	855	15,628,324	3,702,454
1930	92,311	2,943	43,283	658	16,150,789	3,480,736
1931	101,479	2,985	51,217	732	16,434,729	2,855,129
1932	87,053	3,439	22,568	521	14,569,719	2,005,169
1933	97,479	2,669	13,117	352	15,809,158	1,683,818
1934	98,512	2,632	15,824	341	16,128,792	2,004,534
1935	109,214	3,638	23,310	298	18,824,470	3,184,778
1936	151,010	4,048	43,081	344	23,060,891	4,591,856
1937	157,717	6,220	27,675	325	25,676,316	3,672,826

would have totaled \$9,971.01. In 1936 the profit computed upon the same basis was \$9,677.92.

Rates

Passenger rates on the Alaska Railroad are 6 cents per mile. A study of the freight rate structure was undertaken during the latter part of 1937, resulting in a general increase in rates, made applicable to practically all classes and commodities.

Coal rates were increased on May 20, 1937, in amounts varying from 25 to 30 cents per ton on local shipments; and the low export rates were increased 60 cents per ton. Petroleum and petroleum products were increased on the same date 15 cents per hundred pounds, being equivalent to 1 cent per gallon. The through rates applying from Seattle and Tacoma, Wash., to railroad points were revised on May 30, 1937, to provide for a 3-percent increase on the railroad proportion of the through rates and a Seward terminal charge of \$2 per ton. Local class and commodity rates were increased 3 percent in the tariff issued in June, effective during July 1937.

A competitive tariff was issued on April 12, 1937, naming earload rates on beer, groceries, and items of iron and steel from Seattle to Anchorage, at an increase over similar rates in effect the previous year during the period of navigation on Cook Inlet.

The Alaska Steamship Co., a party to the through tariff, increased their proportion of the through rate 5 cents per hundred pounds on October 15, 1936.

Upon the basis of the increased freight tariffs there follows a comparison of the rates in effect on the Copper River & Northwestern, the White Pass & Yukon, and the Alaska Railroads over comparable distances. The rates used are for less than earload lots.

Commodity	Copper River & Northwestern (113.7 miles)	White Pass & Yukon River (110.7 miles)	The Alaska Railroad (114.3 miles)
	Cents per 100 lb.	Cents per 100 lb.	Cents per 100 lb.
Machinery, mining	181	303	74
Explosives	287	636	233
Lumber	81	303	37
Coal	44	303	47
Oranges	293	421	158
Tomatoes	341	530	186
Lettuce	341	530	186
Onions	241	333	112
Potatoes	195	333	112
Apples	241	333	130
Eggs	389	530	158
Flour	195	303	112
Canned goods and other groceries	195	303	112
Bacon and ham	241	333	112
Grain and feed	156	-----	37
Gasoline and oil (earload)	80	-----	67

Traffic Resources of Area Served

The railroad, until the present time, has depended upon the mining industry and its attendant activities for the bulk of its freight and passenger business. It, in turn, has been instrumental in stimulating the production of minerals. It is significant that the value of the mineral production in the railroad area in 1923 at the completion of the road was approximately one-seventh of the production of all Alaska, while in 1936 it was approximately one-half. In that year minerals produced from the area served by the railroad had a value of about \$11,000,000.

In point of value gold is the chief metal produced but in the fiscal year 1937 approximately 140,000 tons of coal were mined in the Healy River and Matanuska fields and approximately 900 tons of antimony ore were mined and shipped to various smelters in the States. Listed among the out-bound freight passing over the Seward Dock in 1937 were 7,038 tons of coal, 1,251 tons of ore, and 2,314 tons of canned salmon.

The railroad and its river steamers serve a rather wide mining area which shows promise of continued substantial production. Within a relatively short distance of its track are the following mining camps and districts: Kenai Peninsula, with camps at frequent intervals from Primrose northward, including those near Moose Pass, Hope, and Sunrise; Girdwood district, with placer camps near the mouth of Crow Creek and lode mines and prospects near the head of that valley; Matanuska Valley, with its coal deposits; Wil-

low Creek with its productive lode gold mines; the Yentna-Cache Creek district, with its scores of placer gold camps; Valdez Creek, mainly known for its placer gold production but with some lode gold developments; Broad Pass-Chulitna district, where showings of lodes of the base metals, as well as gold have been discovered; Mount Eielson district, within the Mount McKinley National Park, where the most promising showings are lode deposits of copper, silver, and lead; Kantishna districts, from which much placer gold has been taken but which also contain lodes of gold, silver, and other minerals; Bonfield district, mainly a placer mining district which has yielded some lode gold and contains lodes of some of the other metals; Healy River district, with its coal deposits; Fairbanks district, the most productive placer gold camp in all Alaska, which also is the scene of prosperous gold lode mining, while to the north of Fairbanks is the Tolovana and Livengood placer district.

In that portion of the Territory reached by the boat service of the Alaska Railroad or by services connecting with it are other important mining districts listed as follows: Hot Springs district, better known for its placer gold camps but affording also placer tin ore; Tanana, the junction point from which boats serve, in part, the placer mining camps in the Rampart, Chendalar, Circle, and Eagle districts, the Dawson (Klondike) and other districts on the Canadian side of the boundary; Ruby district, where a number of placer gold mines are in operation and where, from the town of Ruby, an overland route leads to the camps in the Poorman, Cripple, Ophir, and Takotna district; Koyukuk, a small settlement at the mouth of the river of the same name, with access to the Koyukuk district and its placer mining camps near Hughes, Alatna, Bettles, and Wiseman; Nulato, near which are extensive exposures of the rocks of the coal-bearing series; Holy Cross, where connections may be made with steamers on the Innoko and Iditarod Rivers; Marshall, the southwestern terminus of the Alaska Railroad boat service, a district in which considerable placer gold has been mined and where connections are made with boats to St. Michael.

Two active coal-mining districts are located on the railroad, the Matanuska and Healy fields. The Matanuska field, situated about 60 miles northeast of Anchorage on a branch line from the town of Matanuska, produces a high-grade bituminous coal for the railroad locomotives, power and heating plants, as well as for local industries and domestic consumption. Shipments of this coal are also made to coast canneries and towns, and there are large reserves for a greater market when such a market is developed.

The Healy River field is connected with the main line of the railroad by a spur at Healy and produces an excellent sub-bituminous coal from beds, some of which are as much as 25 to 40 feet thick, and many of which are visible from the main line of the railroad. This coal has a wide use for domestic purposes, power plants, and other industries at Nenana and Fairbanks. The reserves in this field are great.

In addition to the present two commercial fields, coals ranging from lignite to semianthracite in rank, located at numerous points along the railroad, are available for local use.

It will thus be seen that the traffic derived from the mining industry gives indication of sustaining at least its present level over a number of years. In cooperation with the Geological Survey the Alaska Railroad has taken an active part in investigating the mineral resources of the territory contributory to it and in making the knowledge thus gained available to prospectors and mine operators.

Tourist traffic over the railroad in the last few years shows a definite increase, and with the construction of a hotel at Mount McKinley Park entrance nearing completion it is expected the increase will continue.

A gradually growing agricultural community recently increased by the Matanuska colony, is expected to furnish a substantial amount of freight and passenger traffic. It will be noted that the railroad has a branch line extending into the Matanuska Valley and that Fairbanks is in the center of the Tanana agricultural district. Although it is expected that the rural population in these valleys will grow only in proportion to the industrial population, agriculture furnishes considerable traffic for the railroad.

Construction and Equipment Requirements

The ratio between operating expenses and operating income depends equally as much upon factors of operation as upon the future of traffic. It must be remembered the railroad operates through rugged territory in a district experiencing heavy snowfall, sudden high waters from mountain streams, slides, and severe winter temperatures. Under such conditions operating costs may be justifiably high.

Although tracklaying of the main line was completed in 1923, much additional work remained to be done to place the roadbed and structures in condition for economical operation. Many miles of track have been ballasted, and steel bridges or earthen fills have been substituted for miles of wooden bridges and trestles. Snow sheds in need of constant repair have been eliminated by line changes. If the greatest economy of operations is to be secured, replacements and improvements of this nature must be continued.

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ROADS¹

Only 2,500 miles of road are available for vehicular traffic in the Territory of Alaska, although the area of the Territory is approximately 600,000 square miles and although one of the essential elements in the development of any new territory is ready access to its productive areas.

Early Road Explorations and Construction

Not until 1898 and 1899, 30 years after the purchase of the Territory, was any effort made by the Federal Government to explore routes for roads and trails.

During this 30-year period following the purchase of Alaska, travel to a large extent was confined to the open waterways in summer and to their frozen courses in winter. Mining machinery and other supplies were usually transported from the coast or river landings over the snow in winter, with some preliminary "brushing out" of the trail when necessary. Travel across country in summer, generally seaking, was possible only on foot or pack horses. This was always difficult and in many instances dangerous because of the numerous swift and deep streams.

In the summers of 1898 and 1899, the War Department sent out expeditions under Captains Abercrombie and Glenn to explore routes from Valdez, the head of Prince William Sound, and from the head of Cook Inlet, to the interior, with a view toward connecting the coast with the navigable waters of the Yukon. Much valuable information was obtained by these expeditions. The existence of a feasible route from Valdez by way of Keystone Canyon and Thompson Pass was first made known through the explorations of the party under Captain Abercrombie. Lieutenant Heron, of Glenn's party discovered Rainy Pass and made his way through the Kuskokwim country to the mouth of the Tanana, on the Yukon, in 1899.

As a result of these explorations and studies, Congress made an appropriation of \$100,000 for roads and trails in Alaska, to be expended under the War Department for the fiscal year 1901. This was practically all spent on the trail leading from Valdez to Eagle. The appropriation was sufficient only for the construction of a pack trail through sections otherwise impassable, and the construction of some of the most necessary bridges

along the route. In the summer of 1904, Congress made an appropriation for the survey and the estimate of the cost of a wagon road along this route, Valdez to Eagle. The survey was executed under the direction of the Chief of Engineers.

Board of Road Commissioners Created

An act of Congress, approved January 27, 1905, provided for establishment of the Board of Road Commissioners of Alaska to operate under the direction of the War Department. The act also created the so-called "Alaska fund," which authorized the use within Alaska of all moneys derived from certain Federally imposed, occupational, and trade license taxes, collected outside of the incorporated towns in the District of Alaska. By subsequent amendments, 65 percent of this fund is available for construction and maintenance of wagon roads, bridges, and trails in Alaska.

The Board came into existence as such by War Department order on May 15, 1905, and established its first office at Skagway. The Territory was at that time almost entirely without roads of any kind throughout its vast area. A short piece of mountain road of primitive character had been built from the town of Juneau to the Silver Bow Basin mining district, and some beginnings of road construction had been undertaken in the Fairbanks mining district by private subscription.

Faced with the enormous task of determining the roads and trails to be constructed, without precedent or guide to follow, either in general administration and conduct of such work or in methods of construction best adapted to the conditions, with the prospect of a somewhat uncertain and varying fund entirely inadequate to meet what was manifestly an immediate and pressing need, the Board of Road Commissioners began its operations, with funds available the first year amounting to \$28,000.

Extent of Construction by Road Commission

Since that beginning, the Board of Road Commissioners, now known as the Alaska Road Commission, over a span of 33 years ending June 30, 1937, has constructed and now maintains 2,058¾ miles of road and tram road, 78 percent of which is suitable for automobiles in all summer weather, 1,612 miles of winter sled road, 6,940½ miles of trail, and 304 miles of flagged trail at a total cost of \$24,014,323.71 of which \$12,497,182.96 was for new work and \$11,517,140.75

¹Prepared from material submitted by a group composed of H. K. Bishop and C. D. Curtiss, Bureau of Public Roads; G. H. Lautz, Forest Service; Paul W. Gordon, Division of Territories and Island Possessions. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

was for maintenance and improvement. Of the total expenditures, 27 percent, or \$6,614,012.58, was obtained from Territorial sources.

By informal arrangement with the National Park Service on April 1, 1922, the Alaska Road Commission undertook to construct roads and trails within Mount McKinley National Park and from 1922 to 1937, has expended the sum of \$1,225,759.27 for the construction and maintenance of 85 miles of road within the Park boundaries.

Bureau of Public Roads Established in the Territory

Beginning in 1917, funds expendable by the Bureau of Public Roads in National Forests were made available for use in the Territory, both construction and maintenance being handled by joint representatives of the Bureau and the Alaska Road Commission. Since July 1, 1920, all roads within the Tongass and Chugach National Forests have been constructed and maintained by the Bureau. Federal appropriations expended by the Bureau for roads in and adjacent to the National Forests of Alaska, under the provisions of the Federal Highway Act and the National Industrial Recovery Act, amount to \$8,666,834.83. In addition, \$325,108.12 has been made available by the Territory, making a total to June 30, 1937, of \$8,991,942.95.

A total of 294 miles of highway has been constructed, of which 241 miles are in active use.

Territorial Road Board

The Alaska Road Commission and the Bureau of Public Roads are, then, the two Federal road construction agencies operating in the Territory, the former constructing and maintaining roads outside National Forests, and the latter, those inside. In addition, the Territorial Government, as has been indicated, appropriates funds for road construction which are allocated under the direction of the Territorial Highway Engineer. For the greater part, construction and maintenance are undertaken through the Federal agencies, but the Territory independently of these maintains approximately 250 miles of road.

Sources of Funds, Alaska Road Commission

Funds for the prosecution of the work of the Alaska Road Commission are provided from six sources, as follows:

(1) Appropriation by the Federal Government to the Department of the Interior for expenditure in conformity with act of Congress approved January 27, 1905, and amendments thereto.

(2) From a portion of the Alaska Fund, a fund covered into the Federal Treasury but derived en-

tirely from special taxes imposed by the Federal Government upon various industries in the Territory.

(3) Funds appropriated by the Territorial Legislature and turned over to the Treasurer of the United States for expenditure on construction, repair and maintenance of roads, bridges, ferries, trails, and related works in the Territory as provided by act of Congress approved June 30, 1921. These funds are expended upon projects designated by the Territorial Board of Road Commissioners.

(4) Money allotted by the National Park Service and expended under its direction entirely within the boundaries of national parks and monuments.

(5) Contributions by individuals, companies, corporations, et cetera.

(6) Funds from Emergency appropriation allotments.

For the fiscal year 1937, the following funds for roads were made available from the above sources:

Item 1---	-----	-----	\$525,000
Item 2---	-----	---	130,000
Item 3-----	-----	-----	69,047
Item 4-----	-----	-----	124,700
Item 5---	-----	---	7,608
Item 6-----	-----	---	350,000

Sources of Funds, Bureau of Public Roads

Forest roads and trails funds expendible in Alaska are secured under the authority of the Federal Highway Aid Act and amendments thereto.

Minor roads and all classes of trails are constructed with Federal funds made available under the forest road development provision of the Federal Highway Act; the 10 percent fund under an act which authorizes the return of 10 percent of gross National Forest receipts for use on roads and trails, and funds carried in the regular annual Forest Service appropriations. The C. C. C. has contributed materially to the construction of projects of this class during the last 4 years. The mileage constructed and maintained since the forests were placed under administration is 33 for minor roads, and 884 for trails of all standards and classes.

The procedure for determining the apportionment of annual appropriations for work in the several States and Territories is definitely prescribed in this act. The apportionment to Alaska for the 3 fiscal years, 1934 to 1937, averaged approximately \$682,000. Under the act of June 16, 1936, which authorized the appropriation of certain sums for forest highways for the entire United States for fiscal years 1938 and 1939, Alaska would normally have been entitled to \$867,000 for each of the 2 years. However, Public 173, Seventy-fifth Congress, approved June 29, 1937, definitely limited

the Alaska apportionment to \$350,000 yearly for those 2 years and provided that the difference between this sum and the normal Alaska apportionment be added to the apportionments of States that fall in certain categories.

The Federal Highway Act does not permit the interchange of funds between the higher standard forest highways and the lower standard forest development roads, although both classes of roads are provided for in this act.

The following tabulation shows the amount apportioned and expended for the fiscal years 1928 to 1937, inclusive, by regular and emergency funds:

Fiscal year	Apportionment			Expenditures		
	Regular	Emergency	Total	Regular	Emergency	Total
1928-----	\$493,415	-----	\$493,415	\$522,119	-----	\$522,119
1929-----	491,041	-----	491,041	562,267	-----	562,267
1930-----	479,292	-----	479,292	453,808	-----	453,808
1931-----	988,803	-----	988,803	697,891	-----	697,891
1932-----	963,671	-----	963,671	815,536	-----	815,536
1933-----	362,480	-----	362,480	314,633	-----	314,633
1934-----	-----	\$410,000	410,000	271,305	\$270,894	542,199
1935-----	-----	691,227	691,227	315,831	251,852	567,683
1936-----	685,935	-----	685,935	335,409	365,835	701,244
1937-----	667,980	-----	667,980	444,880	169,537	614,417
Total.....	5,132,617	1,101,227	6,233,844	4,733,679	1,058,118	5,791,797
Average ¹	513,261	550,613	623,884	473,368	264,530	579,180

¹ The funds for minor roads and trails originating under the forest road development provisions of the Federal Highway Act averaged approximately \$12,000 per year over the 17-year period since the act was passed. The amount for the fiscal year 1937 was \$9,233. The 10-percent fund previously mentioned provides an average of about \$8,000 yearly for minor roads and trails.

Construction Practices, Alaska Road Commission

Although standard construction and maintenance methods are employed in constructing roads under the supervision of the Alaska Road Commission so far as practicable, it is necessary to vary therefrom in some instances because of special physical and climatic conditions.

The frozen condition of the subsoil and the constant thawing during summer, require special precautions for drainage. Intercepting ditches on the uphill side of the road are frequently necessary and after the vegetation has been stripped from the roadway, the ground must be allowed to thaw, settle and consolidate for several months before completing the grading and applying the surfacing. Frequently one or more seasons are required for such drainage and consolidation and in order to maintain traffic during this period, corduroy must be used. Sloughing banks, due to thawing of the subsurface ice, frequently cause slides which cover and block the roads.

Special methods of revetment and stream control must be used to withstand the destructive effects of sudden and frequent freshets and washouts that result from heavy rains in the mountains or the release of impounded waters by breaks in glaciers. The most

suitable type of revetment for this purpose is built of brush weighted down with stone in bundles wrapped in wire mesh to prevent its washing away.

Gravel for road surfacing is generally available within reasonable hauling distance. Surfacing is necessary for practically all roads which are used by automobiles. Concrete or other forms of hard-surfaced roads are nowhere warranted in the present stage of development of the Territory.

Bridges are built of native or imported timber or steel, depending on their importance. Fir has been found to be the most suitable material for timber bridges but local timber is used for part of these structures. Metal culverts are used to replace culverts of native timber ordinarily used on new construction.

Ordinarily a road goes through the several developmental stages, trail, winter tractor road, summer tractor road, and finally if conditions warrant, it is completed as a truck road.

Construction Practice—Bureau of Public Roads

Naturally, with variations, many of the same construction difficulties facing the Alaska Road Commission in its construction of roads, for the most part in the interior of Alaska, are also present in the National Forests. Nevertheless due in a great part to the greater concentration of population in southeastern Alaska and to the difference in type of vehicular traffic using the roads and trails there are some differences of construction methods.

The type of surface on roads built as forest highways in Alaska usually is a pit gravel or crushed stone or crushed gravel not generally exceeding 18 feet in width. Drainage and grading and subgrade structures are as a rule greatly conditioned by the characteristic heavy precipitation and low winter temperatures.

During the last 3 fiscal years (1935-37) the average yearly expenditure for maintenance was \$118,000.

Trails and minor roads.—Trails are built for a great variety of purposes, but the most outstanding class of trail is that which opens up mineralized regions to the prospector. The obstacles to cross-country foot travel on the southern coast of Alaska are so great that large sections are practically inaccessible to the prospector until opened up with trails. The first trail work in any region is a reconnaissance to determine the justification of a trail (usually on a basis of mineral values) and the probable cost of construction. If this reconnaissance is favorable, a foot trail is then built. This is later improved into a pack trail in those localities where mining or other activities have followed the original improvement. When warranted by development of the region these pack trails may later be reconstructed into roads.

A minor road development program has been established to cover needed roads of lower standard than forest highways. These minor roads are selected and built by the Forest Service. The program is changed and enlarged as conditions justify such action. The total mileage in the program as now constituted is 130 miles.

The construction cost of minor roads is around \$5,000 per mile. Trail costs range from a nominal figure to as much as \$1,000 per mile.

Construction Program—Bureau of Public Roads

In the national forest region of Alaska "mainline" transportation is already available in the form of an extensive network of protected waterways for local travel and commerce, and the high seas for reaching the other sections of the world. To supplement this arterial system a large number of roads and trails are needed to "open up" the adjoining localities. Roads are required to connect industrial plants, producing mines, agricultural areas, and bodies of standing timber with the nearest permanent town or ocean port. Trails are needed to give access to the back country for a great variety of purposes and especially for prospecting in the great mineralized zone of the high mainland mountains that extend along the full length of the Tongass Forest.

The National Forests consist of islands and a comparatively narrow strip of mainland adjacent to the sea coast. The sea channels are accordingly the main arteries of transportation. In a few cases roads leading from the coast back into the interior are desirable, but the principal need is for local roads leading inland for short distances, or extending out from the towns along the waterfront. Such roads help to develop isolated agricultural and mining areas, open up areas of great scenic beauty, provide an alternate method of transportation in seasons when water travel by small boats is dangerous, open up residential and industrial sites adjacent to the towns, and, where leading from the larger towns, make the communities more desirable places in which to live, thus encouraging a permanent population through their social and recreational value as auto roads. The roads now being constructed are, without doubt, proving a great factor in improving business and living conditions on the southern coast of Alaska.

The high standard highway needs of the more intensively developed sections of the National Forest region are covered by a forest highway program. Construction projects are programmed annually by the Secretary of Agriculture after joint recommendation of the Territorial Road Commission, Forest Service, and Bureau of Public Roads. Construction and main-

tenance in accordance with this program have been progressing for many years under the direction of the Bureau of Public Roads from funds made available annually under section 23 of the Federal Highway Act of November 9, 1921, which authorizes the construction of public highways in National Forests. The following tabulation shows the mileage approved, improved, and remaining to be improved, by routes, as of June 30, 1937:

Highway No.	Name	Approved	Improved	Remaining to be improved
1	Tongass.....	51.0	20.1	30.9
2	Glacier.....	57.5	43.6	13.9
3	Seward.....	34.2	27.8	6.4
4	Cordova.....	20.0	7.1	12.9
5	Kenai River.....	18.8	6.7	12.1
7	Mitkof.....	17.0	10.6	6.4
9	Salmon River.....	12.2	12.2	.....
10	Yakutat.....	1.4	1.4	.....
11	Sitka.....	12.9	4.6	8.3
12	Crow Creek.....	7.8	7.8	.....
13	Palmer Creek.....	11.9	11.9	.....
14	Moose Pass.....	46.0	45.5	.5
15	Petersburg Creek.....	6.0	2.8	3.2
16	Wrangell.....	13.6	6.3	7.3
17	Skagway.....	7.0	4.8	2.2
18	Texas Creek.....	11.7	11.7	.....
19	Kake.....	3.0	1.4	1.6
20	Ilydaburg.....	.9	.9	.....
22	Angoon.....	2.7	.....	2.7
23	Gartina.....	7.0	1.4	5.6
24	Tenakee.....	5.0	.....	5.0
26	Point Agassiz.....	8.0	4.6	3.4
28	West Coast.....	7.7	1.2	6.5
30	Afognak Lake.....	4.5	4.5	.....
31	Douglas.....	11.0	2.0	9.0
	Total.....	378.8	240.9	137.9

Construction Program—Alaska Road Commission

The road requirements confronting the Alaska Road Commission, operating for the greater part in interior Alaska, may be said to be somewhat different. Great distances are to be covered for the transportation of heavy machinery or supplies often between developments the permanency of which has not been established. For the most part roads are constructed from central distributing centers, tide or river landings to the seat of industrial operations. There are, comparatively speaking, no through trunk roads. Notable exceptions are the Anchorage-Palmer road system and the Richardson and Steese Highways. Justification of road construction must often be based upon expected development of an area. Road construction can safely be said to be the key to the development of many of the mining and agricultural areas of Alaska.

All existing mileage has been maintained and improved so far as funds have permitted. The present system of roads serves as the basis for future development of overland routes throughout the Territory. This development calls only for additional funds for construction.

A standard cost system is maintained in all districts from which, over a period of years, valuable information can be secured in the preparation of esti-

mates. In the use of such data, however, consideration must be given to the large difference in freight rates, labor costs, and climatic conditions in the various sections.

In the interior of Alaska the average cost for construction of a mile of gravel-surfaced road capable of continuous traffic in any kind of summer weather, and of such width as to enable cars to pass at any point is \$8,000.

Annual maintenance costs, including minor improvements, are estimated as \$350 per mile for roads, \$20 for sled roads, \$10 for trail, and \$3 for flagged trails. For the working season of 1936 the expenditure for maintenance per mile, including minor improvements, was \$316 for roads, \$18 for sled roads, \$8 for trails, and \$5 for flagged trails. Maintenance was considered insufficient due to lack of funds.

The Alaska Road Commission has prepared a comprehensive road-construction program covering a period of 6 years designed to meet the deficiencies now existing. Total cost for the construction of new roads and maintenance of existing as well as newly constructed highways over a 6-year period is estimated at \$11,980,000, or approximately \$2,000,000 per annum.

International Highway

Of utmost importance to the development of the Territory is the early construction of a highway connecting Alaska with continental United States. In 1933, a commission appointed to study the proposed highway reported it to be feasible at an estimated cost of approximately \$14,000,000—\$2,000,000 for mileage in Alaska and \$12,000,000 for the Canadian section. The contemplated highway would extend from Seattle, Wash., to Fairbanks, Alaska.

On August 26, 1935, an act was approved authorizing the President through such channels as he might deem proper, to negotiate with the Canadian Government for the survey, location, and construction of the proposed project. No funds have been appropriated or allocated for such construction should the negotiations reach a conclusion favorable to the construction.

The committee appointed to consider this project made a comprehensive report, 1933 Conference Series No. 14 of the Department of State. The report summarizes the benefits to be derived as follows:

(a) Development of Alaska through making the Territory accessible by highway, resulting in an increase of population

and consequent increase in revenue from taxes, tending to decrease the present necessity for Federal appropriations for the support of the Territory.

(b) The road would be a great contribution to the welfare of American citizens now living in Alaska under adverse conditions, by providing a physical connection with the vast continental road system.

(c) Opening of new country that is now practically inaccessible, giving opportunity for settlement, investment of capital, and employment.

(d) The new road would make accessible to the continental highway system the existing road net in central Alaska comprising about 900 miles, providing a new and valuable area for exploration, for recreation, or for business purposes.

(e) The highway would foster air commerce with Alaska by furnishing a guiding landmark and providing service to aviators along the most practicable flying route to the interior of the Territory and to Asia.

(f) Promotion of friendly relations between citizens of the United States and Canada

Looking forward to the construction of the highway the commissioners recommended: That negotiations be conducted with Canada to arrange for the location and survey of the most satisfactory route, to prepare estimates and to investigate plans for financing the project; that in case of an agreement with the Canadian Government funds be made available for carrying out the purposes of the agreement; that each Government in its road program conform, as far as practicable, to the general route proposed for the International Highway; and that consideration be given to the immediate construction of the Fairbanks-Dawson section.

In the reconnaissance study the route proposed for the highway follows the existing road up the Frazier River Valley in British Columbia to Hazelton; thence north to the headwaters of the Yukon River; thence down the Yukon Valley through Whitehorse and Dawson to Fairbanks, Alaska. It is estimated that the proposed highway will be 2,256 miles in length from Seattle to Fairbanks; of this 1,073 miles are now completed. A table showing the approximate mileage now completed and yet to be constructed follows:

Route	Completed road	New construction needed	Total
	<i>Miles</i>	<i>Miles</i>	<i>Miles</i>
Seattle to Hazelton, British Columbia.....	882	0	882
Vancouver to Hazelton, British Columbia.....	830	0	830
Hazelton to Yukon boundary.....	50	520	570
Yukon boundary to Alaska boundary.....	50	480	530
Alaska boundary to Fairbanks.....	91	183	274
Seattle to Fairbanks.....	1,073	1,183	2,256
Vancouver to Fairbanks.....	1,021	1,183	2,204

COMMUNICATIONS¹

It is the purpose of this section to discuss the existing situation in respect to communications in Alaska and to suggest remedial measures that may be taken to correct known deficiencies. Also, there is included sufficient historical background and sufficient discussion of matters other than communication, such as transportation and climate, to give an adequate picture of Alaska as it exists today. It will be noted that many deficiencies in communication exist in Alaska for which no remedy is suggested. Careful consideration has been given to all the factors involved and only those needs are specifically mentioned which are believed to be necessary for the public welfare, physically possible of installation, and economically justified at this time or within a reasonable time in the future.

The communication installations needed for national defense are not considered specifically in this section, for while it is true that many of the facilities mentioned as desirable would be useful in connection with defense, their installation is suggested herein on the basis of peacetime needs only.

Historical Features

For several years before Alaska was purchased (1867) from Russia, the Western Union Telegraph Co. had been negotiating with the Telegraph Department of Russia for the joint construction of a telegraph line from Europe to the United States by way of the Bering Straits. A report accompanying a bill (H. R. 998), February 18, 1861, indicated that terms of the arrangements between the Russian Government and the Western Union had been worked out. This bill was to appropriate \$50,000 for a survey, but it failed of enactment. The same matter was before Congress several times until finally an act (Public 171) was passed and approved by President Lincoln on July 1, 1864, "to encourage and facilitate telegraphic communications between the eastern and western continents." This act embodied a grant to Perry MacDonald Collins (a director of the Western Union Telegraph Co.), a citizen of the United States, and

included therein the right to construct telegraph lines to the boundaries of British America. This right was predicated on similar privileges granted to Collins by Russia and Great Britain to construct telegraph lines through their respective territories "from the mouth of the Amoor River in Asiatic Russia, by way of Bering Straits and along the Pacific coast to the northern boundaries of the United States." Work was started in 1866, much of the material was on the ground, and during this year many miles of poles were erected in the territory which is now Alaska. This enterprise was never completed and for a period of thirty-four years activity in Alaska with respect to electrical means of communication apparently ceased.

The Washington-Alaska Military Cable and Telegraph System was authorized by the act of Congress of May 26, 1900, for the purpose of connecting the United States Army headquarters at St. Michael by military telegraph and cable lines with other military stations in Alaska. The system was operated by the War Department under the direction of the Chief Signal Officer of the Army. This original act also provided that commercial business might be transmitted over the system under such conditions as the Secretary of War might deem equitable and in the public interest. This communication system, as first established, consisted of land telegraph lines between important points. Subsequently, these land telegraph lines were augmented with short lengths of submarine cable, and in 1904 the installation of a submarine cable afforded direct communication between the United States and Alaska. This cable was operated from that time until 1931. Due to age with consequent increase in cost of maintenance and due to the development of efficient and economical radio apparatus, it then was supplanted by a network of radio stations for communication to and from the Territory. During this period the land telegraph lines were gradually abandoned, being supplanted by radiotelephone and radiotelegraph facilities. Today, this network of radio stations represents the principal means of communication for the Territory of Alaska.

During the past several years, many of the smaller nonpaying radio stations have been transferred to various community and commercial interests which use radiotelephone means to connect to the nearest Signal Corps station equipped to handle radiotelephone service, such as at Ketchikan, Juneau, Anchorage, Fairbanks, Nome, Wrangell, Kodiak, and Flat.

¹Prepared from material submitted by a group composed of E. M. Webster and E. L. White, of the Federal Communications Commission; Capt. V. A. Conrad, Army Signal Corps; Comdr. J. F. Farley, Coast Guard; Comdr. R. H. Blair, Office of Naval Communications; David E. Thomas, Office of Indian Affairs; Eugene Sibley, Bureau of Air Commerce; W. E. Triem and Charles H. Stephenson, of the Post Office Department; E. B. Calvert, Weather Bureau; and S. F. Clark, Bureau of Lighthouses. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named group.

In May 1936 the name of the system was changed from the Washington-Alaska Military Cable and Telegraph System to the Alaska Communication System. In July 1937 the Signal Corps inaugurated a radio-telephone circuit between Seattle and Juneau which connects with the Bell System through the Seattle, Wash., exchange.

Generally the War Department during the past few years has been primarily concerned with the establishment of arterial communications and the providing of means for handling at key stations the increasing traffic, both governmental and commercial. This increased traffic has resulted from the increased interests of other Government departments in Alaska and from the opening of new stations established by commercial interests. The traffic handled today by the Alaska Communication System is approximately two-thirds commercial and one-third Government. Only about 3 percent of the total traffic is of a strictly military nature.

In 1926 the Alaska Road Commission took over the abandoned Signal Corps telegraph line from Valdez to Fairbanks and has since operated it as a telephone system. A branch line to Chitina was constructed in 1927 and to Nabesna in the years 1930 to 1934 in connection with road construction work of the Commission.

At the time of establishment of the Federal Radio Commission in 1927, predecessor of the Federal Communications Commission, very little study had ever been made of the private communication systems existing within Alaska. At that time the use of radio in the Territory was not at all general. As a matter of actual operating practice, any reasonable request for authority to install radio facilities was granted. This course as pursued was possibly due to the impracticability of an investigation of the circumstances by the Commission and to the pressure of work arising from its other activities. It quickly developed that this policy if continued in force would lead to chaos, and an arrangement was reached with the Signal Corps of the United States Army for coordination of private communication facilities in Alaska with the facilities operated by the Signal Corps. It was also agreed that facilities desired for purely private use would not be authorized, and that each person desiring to install and operate a radio station in the Territory should be required to accept for transmission any traffic submitted by the public. This plan has operated very successfully and at the present time there are in operation 471 nongovernmental stations of various classes, licensed by the present Federal Communications Commission. In order that these facilities may be inspected from time to time, the commission has a representative in Alaska with offices at Juneau.

The Navy originally built a number of radio stations in Alaska to serve a dual purpose—to serve the fleet and to provide commercial communication where none was available. The earliest station built was at Cape Whitsed, in 1905, followed by that at Sitka in the same year, several more in 1911–17, and three radio direction finder stations in 1921. These stations have all been closed or turned over to the Army or, in the case of St. Paul Island, Bering Sea, to the Bureau of Fisheries, Department of Commerce, excepting that at Dutch Harbor and the two radio direction finder stations at Soapstone Point and Cape Hinchinbrook. The Dutch Harbor station handles commercial radio traffic with ships and the mainland. The two radio direction finder stations furnish radio bearings to ships of all nationalities and classes. In addition, the Navy radio station at Sitka has been reopened for naval use, solely in connection with the operations of a naval seaplane squadron based at that place. This station, however, is available for the handling of any emergency radio traffic regardless of its source.

The station at St. Paul Island, which, as mentioned above, was turned over to the Bureau of Fisheries by the Navy is used primarily in connection with the activities of that Bureau in the protection of the aquatic resources in Alaska, but it is also available for handling commercial communications. In this work a number of patrol boats are operated, of which seven are radio equipped.

The Office of Indian Affairs, Department of the Interior, operates 100 community day schools, 2 boarding schools, and 7 hospitals scattered throughout the Territory, especially along the seacoast and the rivers. These schools are exclusively for Indians and Eskimos. The Alaska School Service for natives began in 1884 and has gradually expanded to its present size. Before the advent of radio, it was extremely difficult for administrative officials to communicate with the teachers, physicians, and nurses at isolated stations. Even today a few of the schools are reached only once or twice a year during the middle of the summer, and this is their only opportunity to receive mail. In the early days communication was by means of the Alaska Military Cable and Telegraph System and by mail carried by dog team to some of the larger villages. Today it is possible to reach most stations by boat or airplane, but even this service is irregular and for most stations infrequent. For the efficient administration of the Indian Service, for the effective operation of medical service, and for the peace of mind and contentment of its personnel, it has become increasingly desirable that radio facilities be installed in practically all of these schools and hospitals.

The Office of Indian Affairs has had at all times the cooperation of other Government agencies, such as the Signal Corps, the Coast Guard, and the Territory of Alaska. In some half dozen instances the Territorial government has purchased and installed radiotelephones in the school buildings which the Office of Indian Affairs operates and maintains. At many of their schools the teachers have purchased from their own funds small radio sets and have secured licenses as amateur radio operators.

Radiophones were installed at two isolated Alaska light stations shortly after the World War for the purposes of the Lighthouse Service and later others were added. Radiotelegraph equipment for point-to-point communication has also been installed wherever radiobeacons have been established at light stations. The first marine radiobeacon was installed at Cape Spencer in 1926 and others have been added at regular intervals up to the present date. As all lighthouses in Alaska are accessible only by water, communication with them has been only possible through radio facilities of the Lighthouse Service or other Government services. The provision of needed communication equipment has been slow but the majority of all Alaska light stations now have adequate means of radio communication.

Between the years 1916 and 1923 the Alaska Railroad was constructed and in connection with its operations telegraph and telephone lines were installed. Although these facilities were primarily for serving the railroad route, they were available for public communication.

During the period in which electrical means of communication were being developed, the Post Office Department undertook handling the mail, the first means of communication in the Territory. On July 23, 1867, shortly after the purchase of Alaska by the United States, a post office was established at Sitka. On July 31, 1867, the postmaster at San Francisco, Calif., was authorized to arrange for special mail service not to exceed once a week from San Francisco to Sitka. The first trip under this order was made prior to December 28, 1867, by the steamer *John L. Stevens*. Communications during the first year were very limited, the records of the Post Office Department showing that but \$54.90 was received by the post office at Sitka from the sale of postage stamps. Military posts having been established at Kodiak, Fort Wrangell, and Fort Tongass, post offices were established at those points prior to 1870.

Facilities for the transmission of mail increased as Alaska was settled and developed. In 1937 the number of post offices was 199 and the gross receipts were \$117,389. Mail transportation in Alaska on account of

climatic conditions and ruggedness of the territory has been confined principally to overland "star route" transportation and powerboat service. "Star route" service is defined as the transportation of the mails on overland routes on which no particular means of transportation is specified. Railroad service from establishment, while very limited, has aided materially in the transmission of the mails between Seward and Fairbanks. During the season of navigation, powerboats have been used as the principal means of transportation, and after the navigation season has closed, service has been performed by "star route" carriers overland. Dog sleds operating under the most adverse conditions have been used from the beginning for this type of service; however, a more expeditious means of transportation, that by airplanes, is now being used on 18 of these "star routes" with a vast saving in time.

In no part of the territories of the United States is there so great a need for the development of weather service as in Alaska and on no other activity is this development so much dependent as on communications. During the Russian occupancy no effort was made to secure continuous and accurate meteorological records, although fairly good records for Sitka are available since 1828. Attention was given to this important need soon after the organization of the meteorological work of the Government under the Army Signal Corps in 1871. For a long time the work had to be confined to the coast and nearby islands. Not until passage of the act of May 26, 1900, and the granting of an appropriation of \$483,000, on March 3, 1903, for cables was it possible to do much in the way of planning for an extended weather service. In comparison with the continental United States, where over 5,000 observation stations are maintained, only 50 such stations are in operation in Alaska.

Physical and Economic Features

For the purpose of considering communication facilities in the Territory, Alaska may be divided into three regions:

(a) Southern Alaska, which comprises that portion below 60° N. latitude including the Alaska Peninsula and Aleutian Island chain. This portion is characterized by deeply indented coast lines, mountains sloping steeply down to sea and the peninsula itself actually broken up into islands by straits and passes. Principal cities are separated from each other by arms of the sea. Such terrain makes the construction and maintenance of roads, pole lines, and other means of surface transportation and communication impracticable.

(b) Central Alaska, comprising the vast valley of the Yukon and Tanana Rivers. This is largely tundra, solidly frozen underneath, becoming swampy on the surface in the short summers. This offers a very poor base for roads, etc.

(c) Northern Alaska, comprising the coastal region fronting on the Arctic Ocean. This is a practically uninhabited barren sloping northward from the Brooks Range of mountains.

The range of climate in Alaska is considerable. It has short, and in some places, comparatively hot summers. Long cold winters with heavy snowfall are prevalent throughout Alaska except along the southern coastal strip. Such a climate renders the construction of highways and surface means of communication impracticable. The long periods of daylight and darkness also have their effect on radio communication. The more northerly harbors are closed for much of the year on account of ice.

The population of Alaska is about 60,000 people of which approximately one-half are white. For the most part the native population is distributed throughout the Territory in small villages or fishing camps. The population in the southern part of Alaska is more dense, particularly in those sections where fishing, canning, and mining operations are carried on. The result of this irregular distribution of population is to produce a great disparity in the ability of the various sections of Alaska to support financially a commercial communication system. Except in the industrial districts, communication facilities can only be considered as luxuries or as necessary for humanitarian reasons.

Present Facilities

The Alaska Communication System operates no wire system at the present time in Alaska. The physical plant is comprised of the headquarters and control radio station in Seattle and a network of 21 stations within the Territory. Communication to any points in Alaska other than the location of these 21 stations is afforded through facilities licensed to members of the public or the Government of the Territory by the Federal Communications Commission. Both a message and money transfer service are available. Long distance radiotelephone service is available solely between Juneau, Alaska, and Seattle, Wash., at which place connection is made to the wire network of the American Telephone & Telegraph System and through that system to the majority of the telephones in the world. The map shows the extent and location of the facilities operated by the Alaska Communication System.

The Federal Communications Commission has licensed 383 stations of various classes for the handling of public message traffic either by telegraph or telephone. These are divided generally into two groups, those handling public messages between ship and shore

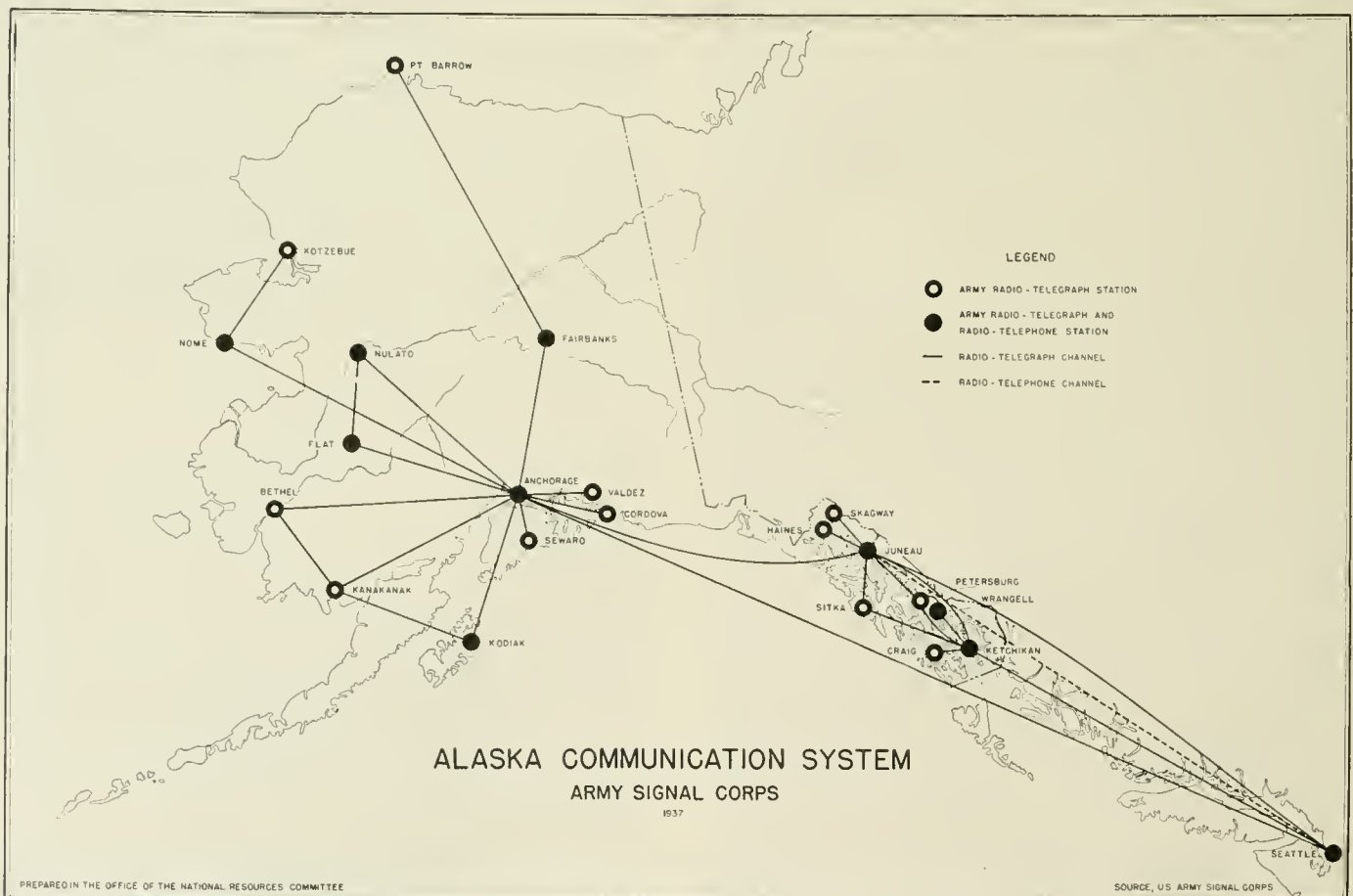


FIGURE 41

and those operated for communication between fixed points on land. The figure mentioned is exclusive of the number of United States ship stations operating exclusively in Alaskan waters.

The point-to-point radio stations authorized in Alaska are those mentioned above which operate in connection with the trunk line communication facilities installed by the Alaska Communication System. For economic reasons and also due to the distribution of population and the need for communication, these stations are concentrated in a relatively small portion of the Territory of Alaska, over 90 percent being located on the southeastern part between Bristol Bay and Ketchikan. In a large number of cases the stations are installed primarily to meet the communication needs of the licensee. However, they are all required to accept messages for transmission from the general public and assume all of the obligations of a common carrier of communications.

The following tabulation shows the number of these stations by classes:

Point-to-point radiotelegraph-----	113
Point-to-point radiotelephone-----	144
Coastal radiotelegraph-----	51
Coastal harbor (radiotelephone)-----	75
Total-----	383

The main telephone line operated by the Alaska Road Commission from Valdez to Fairbanks measures 371 miles. The branch line to Chitina is 39 miles long and that to Nabesna 106 miles. The total line in service at the present time is therefore 516 miles. The highway line connects through the Fairbanks switchboard to all city telephones and the telephones installed in all roadhouses and construction camps along the telephone route. A small switchboard is maintained at Copper Center by the Alaska Road Commission which serves to clear up the service on the line to Nabesna, Chitina, and Valdez. Through conversations from Valdez to Fairbanks are not possible, but messages can be relayed through the Rapids Roadhouse. Due to the condition of the old line and the fact that during the winter months the Richardson Highway is not kept open nor serviced over its entire length by the Alaska Road Commission, uninterrupted service is not possible at the present maintenance cost. The Alaska Road Commission, because its primary purpose is the construction and maintenance of roads in Alaska, must maintain this telephone system as an adjunct to its construction work. Under such conditions it is doubtful if it would be justified in expending sufficient funds to render what normally would be considered a first-class telephone system.

The Alaska Railroad is now operating 501 miles of telephone and telegraph lines. Both telegraph and tel-

ephone lines are strung on a one-pole line and are used both for commercial purposes and for company business. The telephone lines of the railroad are available for long distance calls between towns and points on the railroad, and telephone communications are handled through the telephone exchanges operated by the cities for which the cities receive 25 percent of the total charges. The telephone calls between points on the railroad that do not pass through a city exchange are handled by railroad employees. The total charges are 1 cent per mile for a three-minute call. Employees of the railroad send and receive commercial telegrams between rail line points and the exchange point with the Alaska Communications System at Seward, Anchorage, and Fairbanks for which the established tolls are collected.

Of the 21 radio stations in Alaska operated by the Alaska Communication System, 14 listen on the frequency of 500 kilocycles (international marine and aircraft distress call and communication frequency) for various periods of time during the day. Most of these stations listen on this frequency for 10 minutes out of each hour or 10 minutes of each 2-hour period during the office hours of the stations. Both Anchorage and Ketchikan listen on this frequency continually. The Alaska Communication System now handles more than 174 weather messages daily and frequently a number of additional messages as required by special occasions. Anchorage and Fairbanks broadcast weather reports by radiotelephone twice daily and Nome transmits similar broadcasts three times daily.

The Coast Guard maintains at the present time radio-equipped vessels in Alaska at the following places: *Alert* and *Cyane* at Ketchikan, *Haida* at Juneau, *Spencer* at Cordova, and *Morris* at Seward. These vessels are all radio equipped and capable of operating on the distress frequency; each ship listens on this frequency continually. In addition, each has a direction finder which covers the intermediate frequency band from 250-550 kilocycles. A radio-equipped seaplane is attached to the *Spencer* at Cordova.

During the period from April to November, the Bering Sea Patrol is operated by the Coast Guard. Basing at Unalaska, its vessels cruise westward to Attu, northward to Point Barrow, and eastward to Naknek at the head of Bristol Bay, and to Seward on the Gulf of Alaska coast. This patrol is composed of from one to five vessels, the maximum number being present between May and August and then diminishing to one large cutter about October 1. This vessel remains in the Bering Sea until the last commercial vessel leaves the sea. Each of these patrol vessels is equipped with direction finder covering frequencies 250 to 550 kilo-

cycles, and stands continuous watch on the distress frequency, and has facilities for operating thereon.

In addition to those covered above, many facilities have been installed for the handling of communications necessary for the protection and safety of life and property. In some cases the equipment was installed for safety purposes only while in other cases it is operated for both safety and general communications. Part of the facilities installed by the Navy Department are operated for the safety of ships at sea. This is particularly true for the direction finding service rendered by the stations at Soapstone Point and Cape Hinchinbrook and the weather broadcast service by the station at Dutch Harbor.

There are 86 radio stations authorized by the Federal Communications Commission primarily for the handling of communication necessary for safety of life and property. Of this number 82 are in the aviation service of which 36 are installed aboard aircraft. In addition to the radio stations aboard aircraft, stations are authorized for installation on the ground for communication with aircraft and also for point-to-point

communication between airports for the transmission of messages relating solely to the aviation needs of aircraft operators.

In addition to the stations in the aviation service, there are four stations authorized under the classification designated as special emergency. This class of station is established to provide an emergency communication facility, paralleling an important facility such as power or water distributing system, normally served by wire. They also may be used in the event of an emergency situation, such as a forest fire or flood, for the establishment of communications to areas not regularly served.

The following tabulation shows the number of radio stations not open to public communication authorized in the so-called safety services:

Aeronautical.....	26
Aeronautical point to point.....	20
Aircraft	36
Special emergency.....	4

Figure 42 shows the locations of these stations in the aviation service.

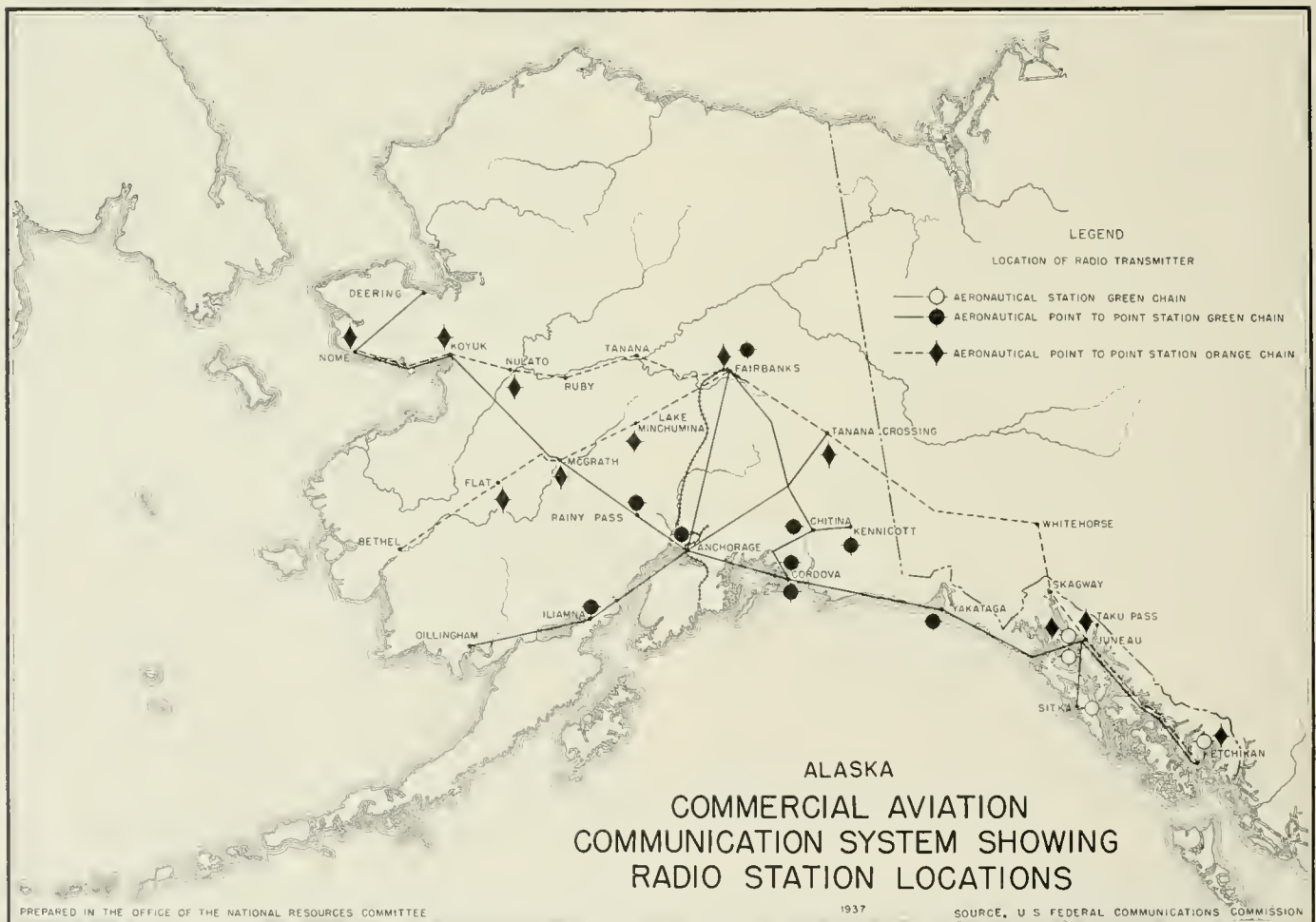


FIGURE 42

In addition to the radio stations shown in the preceding tabulations, the University of Alaska is operating a radio station experimentally in connection with radio research conducted with the object of obtaining more information with regard to radio transmission conditions in the Territory of Alaska.

It is, of course, understood that any radio station located in Alaska or elsewhere, or any other communication that may be suitable, is available and is used for emergency communication in the case of a disaster or other unforeseen circumstances.

All mails for Alaska are now dispatched from Seattle, Wash. During the summer season all classes of mail are dispatched. During the winter season (from October 1 to May 1) on account of difficulty of inland transportation, the dispatch of mail for Alaska, except for post offices on the southern coast and those supplied by railroads, is limited, preference being given to letters in their usual and ordinary form, postal cards, newspapers, and a limited class of merchandise. About 100 of the 199 post offices in Alaska have this restricted service. At best this service is slow as compared with that afforded the mail elsewhere in the United States and its possessions.

At the present time during the winter season, service on about 18 routes is provided by airplane under "star route" authorization. These include the two trunk line routes from Fairbanks to Nome and from Fairbanks to Bethel. During the summer season the only means of transportation for the major portion of the mails is by boat.

Regulation

In 1929 the Signal Corps, in cooperation with the Federal Radio Commission, assumed the responsibility of acting as the Commission's agent in regulating and policing radio traffic in Alaska, mainly for the protection of its own circuits and to achieve cooperation in the handling of traffic flowing to and from the Signal Corps communication network. In addition, the Signal Corps has rendered an advisory service to applicants in connection with the handling of matters in regard to obtaining licenses from the Federal Radio Commission and its successor, the Federal Communications Commission.

The Federal Communications Commission, operating under the Communications Act of 1934, and the Alaska Aeronautics and Communication Commission, operating under an act adopted by the Alaska Legislature during its session in the spring of 1937, have jurisdiction over various phases of the operation of radio stations by private individuals, corporations and the Territorial Government. The various Federal govern-

ment agencies are responsible for the proper operation and regulation of the stations each has established.

The Alaska Aeronautics and Communication Commission fulfills a regulatory need within that Territory which is met within the various States by other organizations such as a State public utilities commission. Exercise of jurisdiction by this body does not conflict with the jurisdiction of the Federal Communications Commission. The Alaska Aeronautics and Communication Commission supervises, installs, and operates various classes of radio stations maintained by the Territory of Alaska under authorizations obtained from the Federal Communications Commission. The Alaska Commission also has promulgated certain regulations requiring the installation of radio equipment on certain aircraft.

Considering the present appropriation providing for the establishment and operation of the Alaska Aeronautics and Communication Commission, together with certain other restrictions embodied in the act providing for its establishment, it is believed impossible for that Commission to administer properly the responsibilities placed under its jurisdiction. Its only measure of success has been obtained through cooperation and through the rendition of service by various persons without remuneration. The act establishing this Alaska Commission is obscure in some respects and should be clarified.

Investments and Operating Costs

The Alaska Communication System, which, as stated above, provides the backbone for communication other than mail within Alaska and for communication between Alaska and Seattle, is valued by the Signal Corps at approximately 1½ million dollars. This estimate includes the plant in Seattle and 21 radio stations in Alaska. The annual appropriation for its operation and maintenance, exclusive of pay and allowances for military personnel, is approximately \$160,000. The following table shows words handled, the appropriation and the receipts for this system, by fiscal years for the past several years:

Fiscal year	Total number of words both government and commercial	Appropriation	Receipts
1929	12,273,196	\$171,930	\$308,292.24
1930	13,018,454	300,000	307,309.10
1931	13,046,776	298,560	290,207.81
1932	11,709,964	161,285	255,923.38
1933	10,992,750	160,772	224,098.01
1934	12,352,873	146,055	248,088.40
1935	13,588,438	148,939	300,374.22
1936	15,050,491	156,753	308,931.47
1937	17,451,530	163,335	366,779.53

The receipts are not credited to the account of the Alaska Communication System but are deposited in the United States Treasury. It should be pointed out that these receipts cover only cash paid for commercial messages. The traffic handled for bureaus and agencies of the Federal Government is carried without charge.

The larger stations of the Alaska Communication System can undoubtedly be classed as paying stations. However, no definite statement can be made as to whether the system, as a whole, is operating at either a profit or a loss. It has not been found possible to apportion any amount of the general cost, pay, allowances and other operating expenses of the Signal Corps to the Alaska Communication System. It may be definitely stated that the Signal Corps operates at a substantial loss several stations which cannot be abandoned for humanitarian or other reasons. On every occasion when a proposal has been made that this governmental activity be superseded by a commercial communication system, one of the conditions that has been made has been that the commercial agency guarantee to render service at least as extensive and as reliable as that operated by the government. Since it is extremely doubtful that some of these non-paying radio stations, especially those located in the most thinly populated area, will ever pay for their maintenance, it is improbable that any reliable commercial organization will desire to take over the present Alaska Communication System and agree to furnish all the communications that are now provided. Therefore it follows logically that any communications that may be added must be installed with the expectation that they will be operated at a loss for some time.

The Alaska Road Commission does not have available the cost of the original telegraph line between Valdez and Fairbanks which was taken over from the Signal Corps; however, since it assumed control of the line in 1926, the Road Commission has expended \$3,264 in capital improvements and extensions. The average annual cost of maintaining the line has been \$6,500.

The total investment of the Alaska Railroad as of June 30, 1937, in lines, equipment, and buildings, including the cost of an automatic exchange at Anchorage used for company business and buildings and equipment not in use valued at \$17,392, totals \$736,192. No separate costs covering operation and maintenance have been kept for commercial and company business, nor for telephone and telegraph business. The annual costs, however, for maintaining and operating the telegraph and telephone lines and exchange facilities for all purposes, during the fiscal year 1937, were: Maintenance \$16,565, operation \$1,083. The income derived during 1937 was \$12,866.73.

The Navy Department has an investment of approximately \$150,000 in facilities in Alaska in addition to those facilities which are needed for purely naval purposes. It also incurs an annual expense of approximately \$38,000 in operating and maintaining these facilities. The receipts for commercial communications are negligible.

The Bureau of Lighthouses has invested \$15,000 to \$20,000 in communication equipment. However, as some of that equipment is shared with radio beacon stations installed for other purposes, the proportion charged to the communication system is somewhat less. The annual expense of maintenance and the annual revenue are both negligible since the communication system is usually maintained incidental to other regular work of the Lighthouse Service, and messages are handled for the public only when no regular means of communication exist.

There is no information available as to the capital investment or annual return in the case of the various classes of radio stations operated by the public. Considering the number of stations that are installed, it is evident that the capital investment is substantial. However, the costs of operation and the financial returns from the communication system are in most cases merged with other costs and receipts, making their segregation difficult if not impossible.

Federal buildings in Alaska controlled by the Post Office Department are located in Cordova, Fairbanks, Juneau, Ketchikan, and Sitka. The latter two, while yet under construction, are substantially complete. The cost to the Government for these buildings, including the land, was approximately 2 million dollars. In 1937 the pay roll for the employees assigned to these buildings was \$41,550. In addition to the Federal buildings above-mentioned, the post office occupies quarters in Federal buildings in Alaska under the control of other departments. At Bethel, Haines, Nenana, Nome, Palmer, Petersburg, Skagway, Valdez, and Wrangell, quarters are rented at an annual cost of approximately \$6,000. The gross postal receipts per annum from all post offices in Alaska during the 10 fiscal years 1928 to 1937, inclusive, have averaged \$97,193. The average cost of operation during this same period was \$779,300 per annum. The cost of operation for the year 1937 may be tabulated as follows:

Compensation to Postmasters and other employees	\$194,574
Leases and rentals	9,617
Transportation, all classes	621,235
Inspections	18,538

Thus making a total cost of \$843,964 as compared to the receipt of \$117,389 during the same period. The

following comparative tabulation for the year 1937 may also be interesting:

Cost per mile for "Star service" in Alaska---	\$0.6671
Cost per mile for "Star service" in United States-----	.0652
Cost per person for delivery of mail in Alaska--	14.00
Cost per person for delivery of mail in United States-----	6.00

Although no information is available as to the proper percentage of postal receipts within the United States proper which should be credited to the mail service in Alaska or to that portion of the receipts in Alaska that should be credited to offset costs of transportation elsewhere, it is obvious that the mail service in Alaska is operated at a substantial loss, and there is no probability that this situation will be materially improved until the ratio of population to area is very substantially increased.

Needs ²

A study of the foregoing material would indicate that without question the development of communications in Alaska to a large measure will be controlled by the development of transportation facilities and by the growth in population. Because of the conditions of climate and terrain, long distance transportation will, in all probability, be accomplished either by air or by water, and because of its great speed and its ability to reach otherwise inaccessible points, we should look to air transportation as being the basic method of transportation. Although there is considerable flying in Alaska at the present time, air transports are subject to many hazards which an adequate communication system would avoid, and until these communications can be installed, the growth in air transportation will be limited. Immediate provision should therefore be made for the installation of the facilities necessary to provide for safe air transport operation.

Aircraft in Alaska is at the present time largely operated without the benefit of the radio aids to navigation and the communication service generally deemed essential for safe air transportation. The Bureau of Air Commerce, Department of Commerce, has never had sufficient funds to make possible the installing of radio ranges, markers, or any other of the facilities normally associated with an air transport route. The type of flying conducted in Alaska is vastly different from that conducted elsewhere. However, the absence

of adequate communication facilities places a very great hazard on this type of transportation and has in all probability been a contributing factor in the loss of many lives.

The communications necessary for the Weather Bureau are undoubtedly involved in this same question, since one of the things necessary for safe aircraft operation is a reliable weather reporting and forecasting service. Unless the Weather Bureau has sufficient points properly equipped and provided with adequate communication facilities, it cannot furnish such a service. Therefore, immediate provision should be made for the enlargement of the system used by the Weather Bureau for the collection and dissemination of weather information in Alaska. Such an expansion would not only serve aviation in Alaska, but would also permit more accurate and complete weather forecasts throughout the North American continent. Among the places where communication service is needed for the indicated purpose are Attu, Diomed Island, St. Lawrence Island, and three or four closely equidistant places between latitude 68° and 70° N. and east of longitude 160° W. to the Canadian boundary.

To provide for air transport communication, provision should be made for radio range, weather reporting, and communication facilities on the routes Ketchikan to Nome, Juneau to Anchorage, Seward to Fairbanks, Bethel to Fairbanks, Anchorage to Good News Bay, Anchorage to Unalaska, Cordova to Fairbanks, Anchorage to Nome, in the order named.

The greatest need, so far as the postal service in Alaska is concerned, is improved transportation facilities in order that the delivery of the mails may be expedited and the service expanded. Due to sparseness of population, topography and climate, it is believed to be economically impracticable to establish an adequate system of roads over which the mails might be transported. The establishment of an airway and airport system to cover the more important parts of Alaska over which the preferential mails, at least, could be transported during the entire year would go a long way in meeting the needs of the postal service.

In order to expand the mail facilities in Alaska there is a great need for an all-year around, high-speed mail service from the United States to Alaska. It would appear that this may best be attained by the authorization of air mail contracts covering air transportation connecting the air transport system in the United States with the existing air transport system in Alaska.

The establishment of the following routes would provide for a year round air mail service from some point in the United States via Juneau, Fairbanks to Nome, with connecting lines from Fairbanks to Bethel

²For a detailed statement of needs for communication facilities in Alaska, see the report of the proceedings of the Alaska Aeronautical and Communications Conference held in Juneau on August 3 to 7, 1937. Except as specifically mentioned in the above text, many of the needs mentioned in these proceedings have already been met.

and from Tanacross via Cordova, Valdez, and Anchorage to Seward:

1. An air mail route, once a week, from some point in the United States to connect at Juneau or Whitehorse with the Juneau-Whitehorse-Fairbanks route which is now under advertisement. Whether the proposed route would be laid out along the coast from Seattle, Wash., via Ketchikan and Petersburg to Juneau; whether it would be run from Spokane, Wash., to Edmonton, Canada, and thence to Whitehorse, or whether it would run from Great Falls, Mont., to Edmonton and Whitehorse, remains to be determined.

2. An air mail route from Fairbanks via intermediate post offices to Nome, 524 miles, once a week from May 7 to October 31 of each year. (This route in conjunction with the service now authorized would provide a year round air mail service between Fairbanks and Nome.)

3. An air mail route from Fairbanks via intermediate post offices to Bethel, 540 miles, once a week from May 1 to October 31 of each year. (This route in conjunction with the service now authorized would provide for a year round air mail service between Fairbanks and Bethel.)

4. An air mail route from Tanacross via Cordova, Valdez, and Anchorage to Seward, 480 miles, 52 round trips per annum (weekly). This route would connect at Tanacross with the proposed Juneau-Whitehorse-Fairbanks line which is now under advertisement for proposals and for which appropriations are available.

The safety of marine transportation in the vicinity of Alaska would be enhanced by installing additional lighthouses and marine radio beacons. Similarly, additional communication facilities for the Bureau of Fisheries would permit that organization to carry out its mission in protecting natural resources to much better advantage.

Provision should be made in the appropriations for the Office of Indian Affairs to permit the installation of radio facilities at all of its hospitals and schools where other communication facilities are not available.

The trunk line radio communication service operated by the Alaska Communication System appears adequate to meet the present public communication needs in Alaska. The existing long distance radiotelephone circuit which now extends only from Seattle to Juneau is expected to be extended to additional points as soon as the quality and extent of the wire telephone service in the vicinity of additional points makes the expansion of the radiotelephone system desirable. The communities in Alaska having a population sufficient to justify a local telephone system should be encouraged to install such a system if not already existent. The apparatus used for local telephone service should be of such quality as would make practicable its inclusion in the world wide telephone network. Existing equipment not of this standard should be replaced by new apparatus of the required quality.

Additional wire communication circuits would be desirable in some respects. However, the difficulties of

construction and maintenance of these circuits render them virtually impracticable under most circumstances, and except for the improvement in the quality of service rendered by existing local telephone service and by the addition of other local wire systems, the needs for additional communication will in all probability have to be met by the use of radio.

In view of the circumstances outlined elsewhere herein, it is not to be expected that trunk line communications will be provided by the inhabitants of Alaska or by any reliable commercial concern. The local communication distribution system should properly be, and in all probability will be, provided by those directly concerned.

The Federal Communications Commission is obliged to depend upon members of the Army Signal Corps for the detailed administration of many of its functions in the Territory. As this work must be carried on in addition to corps duties, many things such as detailed and regular inspections of all licensed stations cannot be done. Additional local offices and personnel of the Federal Communications Commission would be of material assistance in correcting irregularities in operation and administration of non-Government stations which result in delay of communications and the rendition of an inferior grade of service.

The increase in communication activity in Alaska, which may be expected with increases in trunk line and aviation facilities, will most certainly require an addition to the inspection force of the Federal Communications Commission.

There appears to be no question that if communications in Alaska are to be developed, the Federal Government will have to provide funds for installation, maintenance, and operation of any major additions. It must also continue to support the present installation for an indefinite period since, for humanitarian reasons, its extent cannot be curtailed.

In conclusion it may be stated that Alaska is unique in the degree to which communication agencies, both Government and private, have cooperated in promoting general welfare and developing a communication system to meet the needs of the Territory. There is no reason to believe that this spirit will not continue. Government agencies in particular have made their communication facilities available to each other, as well as to the other branches of the Government who do not maintain communication facilities. No doubt this policy will continue and as new facilities are provided their location may well be influenced in many cases by the needs of all concerned. Other cases may be developed wherein agencies may combine in providing facilities to be used for the benefit of each.

General

The President's letter of August 30, 1937, to the chairman of the National Resources Committee, directs that the report for Concurrent Resolution No. 24 should include "as much of a national defense program for the Territory as the War and Navy Departments may determine to be in the public interest."

The defense of Alaska, an outlying possession, involves such local defense measures in the Territory of Alaska as may be necessary and the defense of sea communications to the Territory, bearing in mind that Alaska, like all other parts of our possessions, receives its initial measure of protection from the United States Fleet.

Existing National Defense Establishments in Alaska

War Department

The Territory of Alaska is attached to the Ninth Corps Area, the headquarters of which are at San Francisco.

The present garrison of Alaska consists of the headquarters, Second Battalion, and Companies E and F of the Seventh Infantry Regiment; detachments from the Ninth Ordnance Service Company and First Signal Service Company; and detachments from Finance, Medical, and Quartermaster Corps. These are stationed at Chilkoot Barracks near Skagway and on June 30, 1937, had a strength of 12 officers and 286 enlisted men.

The Army Signal Corps operates the Alaska Communication System. The physical plant of the system consists of the headquarters and control radio station in Seattle and a network of 21 stations within the Territory. The personnel consists of 4 commissioned officers, 2 warrant officers, 185 enlisted men, and 37 civilians, a total of 228, of whom 94 are at Seattle. For further information on the Alaska Communication System see the staff report on Communications.

The Corps of Engineers of the Army is charged with the maintenance and improvement of rivers and harbors for navigation and flood control; administration of laws including issue of permits for structures and operations affecting the navigable waters of the Territory, and surveys and examinations of water-

ways for the preparation of definite projects for improvement. For further information on the activities of the Corps of Engineers of the Army in Alaska see the staff reports on Mapping and Charting, Water (including hydroelectric power) and Water Transportation.

Navy Department

Alaska is within the limits of the Thirteenth Naval District, the headquarters of which are at Seattle, Wash.

The following naval establishments are maintained in Alaska:

(a) Seaplane station on Japonski Island (opposite Sitka), on which is now based a small seaplane tender and a squadron of six patrol planes. The squadron of planes may be increased to 12 planes. A radio station used solely in connection with the operations of the planes is a part of the establishment. The complement of this establishment, including the tender and 12 planes, will be about 31 officers and 185 enlisted men.

(b) Radio Station, Dutch Harbor, Unalaska, personnel 9 enlisted men.

(c) Radio direction finder station, Soapstone Point, Cross Sound, personnel six enlisted men.

(d) Radio direction finder station, Cape Hinchinbrook, Prince William Sound, personnel six enlisted men.

The three radio establishments are a part of the naval communication service on the Pacific coast for the operations of the fleet. Their relation to the general communication system of Alaska is covered in the staff report on Communications.

The following are seasonal activities of the Navy Department in Alaska:

(a) Each year, since 1915, with the exception of 3 years, a naval cargo ship has made a summer trip to Dutch Harbor and the Pribilof Islands for the purpose of transporting supplies and baggage destined for activities of the Bureau of Fisheries, Office of Indian Affairs and the Navy Department at those places and to bring back such passengers as may be authorized, the annual take of seal skins, certain byproducts of the seal killing, and such cargo and effects as may be authorized.

(b) The Hydrographic Office, Bureau of Navigation, Navy Department, has surveyed some areas in the Aleutian Islands. For further information on this activity see the staff report on Mapping and Charting.

(c) During the spring, summer and fall months of each year, some vessels of the Navy visit various Alaska ports in the course of training cruises with naval reserves or during fleet exercises.

The following are the reservations in Alaska under the jurisdiction of the Navy Department:

¹ Prepared by Capt. R. E. Ingersoll, Office of the Chief of Naval Operations, U. S. Navy, and Lt. Col. R. P. Hartle, War Plans Division, General Staff, U. S. Army. The National Resources Committee assumes no responsibility for the recommendations in this section. They represent the views and opinions of the above-named authors.

(a) Active stations—

Location	Charter	Acres
Japonski Island.....	Seaplane station.....	200.7
Dutch Harbor.....	Radio station.....	78.8
Soapstone Point.....	Direction-finder station.....	10.0
Cape Hinchinbrook.....	do.....	1.0

(b) Inactive stations.—

Location	Charter	Acres
Cordova (Eyak) ¹	Radio Station.....	640.0
Juneau ²	do.....	1.3
Kodiak (Woodly Island) ³	do.....	8.4
Seward ⁴	do.....	44.8

¹ Being dismantled.³ Closed.² Operated by the Army.⁴ Burned down.

(c) Underdeveloped reservations.—

Location	Purpose for which set aside	Acres
Adakh Island.....	Naval purposes.....	580.0
Bierka.....	Radio station.....	1,631.9
Cold Bay-Dolgoi Island.....	Use and benefit.....	933,600.0
Cordova Bay.....	Coaling station.....	296.0
Dutch Harbor.....	Coal depot.....	23.0
Hawkins Island.....	Naval purposes.....	20,500.0
Icy Cape.....	Petroleum reserve No. 4.....	28,238,000.0
Jamestown Bay.....	Wharf and other purposes.....	4.0
Juneau Island.....	Coaling station.....	1.0
Kiska Island ¹	Naval purposes.....	32,000.0
Kodiak (Womens Bay).....	do.....	40.0
Passage Canal.....	Wharves, coal storage.....	24,320.0
Port Orah.....	Naval purposes.....	3,550.0
Resurrection Bay.....	Coal depot.....	3.9
Seward.....	Wharves, coal storage.....	64,640.0
Unalaska.....	Use.....	378.8
Unalga Island.....	Wireless station.....	177,920.0
Wide Bay.....	Use.....	10,240.0
Yakutat Bay.....	Use.....	

¹ Kiska is closed by Executive Order to visits of foreign vessels except by permission of the Navy Department.

Further Development

War Department

There appears at present to be no necessity, from the viewpoint of the national defense, of increasing the military garrison in Alaska.

When budgetary limitations permit and after other and more urgent military needs have been appropriated for, an appropriation will be asked for the establishment of a temporary experimental air base in Alaska for the purpose of obtaining experimental data that would be helpful in the employment of military aviation in Alaska in case of war.

Navy Department

The specific views (given below) in regard to the peace-time development of naval facilities in Alaska are based on the following considerations:

(a) For the purposes of local defense the Navy does not, in time of peace, maintain forces solely for that purpose. It relies in time of peace on the United States Fleet for the general defense of the Territory and delays the creation of purely local defense forces until mobilization because of the prohibitive cost of maintaining local defense forces in time of peace. In those cases where existing commercial facilities are entirely inadequate to support local defense forces which may be mobilized in the event of war, the Navy does establish nuclei which can be expanded in the event of war.

(b) The character of the coast of Alaska and the Aleutian Islands is such that there are many places from which mobile forces can operate. Accurate surveys of all such places have not yet been made. It is not desirable, nor necessary, to provide facilities ashore in time of peace at all these places. Whether or not they would all be used would depend upon enemy activities in the area, weather and visibility conditions at the time, which vary with the seasons.

(c) The Navy Department is on record as not in favor of very large appropriations for naval facilities in Alaska. In commenting to the Bureau of the Budget on House bill 3996, to authorize \$100,000,000 for naval facilities in Alaska, it stated that \$100,000,000 was an excessive sum for the developments anticipated. It recommended to the Bureau of the Budget that the amount be changed to \$10,000,000. The bill was not in accord with the program of the President.

The following represents the views of the Navy Department with regard to the peace time development of naval facilities in Alaska.

(a) Three establishments, located at Sitka, Kodiak, and Unalaska, with facilities for the operation of seaplanes, capable of expansion in time of war. The Navy Department has already established a seaplane station at Sitka and will establish another at Kodiak in the near future by a rehabilitation of the closed radio station there. It proposes subsequently to proceed with the development of Unalaska. Since the Navy in coastal frontier defense is responsible for the patrol of the coastal zone and for the control and protection of shipping therein all these three localities should be capable of supporting in an emergency minor naval forces for the foregoing purposes, either with facilities ashore or with floating facilities in auxiliary vessels, or both.

(b) Maintenance of existing naval radio and direction finding stations as a part of the naval communication service in the Pacific for the operation of the United States Fleet.

(c) Organization of Alaska as a complete unit, probably initially as a subdistrict of the Thirteenth Naval District, and when necessary as a separate naval district.

(d) Retention of existing naval reservations in Alaska for use of naval forces in the event of war, and the establishment of such additional reservations as may be found necessary upon further study of the problem of defense. Retention without development for the present of the fuel oil reservation.

(e) Completion of surveys by the Coast and Geodetic Survey of those areas in which naval forces may have to operate.

Both Departments

Both departments will cooperate with and support other Government departments in formulating plans for developing facilities in Alaska that contribute to national defense, such as—

(a) Civil aviation establishments, airways, aids to flying and weather reports.

(b) Mapping.

(c) Charting and aids to ship navigation.

(d) Development of mineral resources, particularly of strategic war materials.

(e) Roads.

(f) Control of alien fishing boats and fishermen.

(g) Prevention of alien monopoly of Alaska resources.

(h) The economic and commercial development of the Territory as a whole.

APPENDIX A

PAST MINERAL PRODUCTION¹

Prior to 1898 the total annual mineral production in Alaska ranged from negligible amounts to a maximum of less than \$3,000,000. After the discovery of gold on the Canadian Klondike and the entrance of a swarm of prospectors and miners into Alaska, production quickly mounted, and ranged around \$20,000,000 per year in the period 1906 to 1914. It then jumped to an all-time peak in 1916 of \$48,000,000 due to large new copper enterprises and wartime prices for that metal. After the war the Alaska mineral output suffered through the fact that the wage scales and opportunities for the use of capital in the continental United States seemed to offer more advantages, with the result that the yearly value ranged between \$10,000,000 and \$16,000,000 until the advance in the price of gold began to exert a beneficial influence. In 1935 the output was \$18,000,000 and in 1936 it was over \$23,000,000.

Gold.—The gold production of Alaska in 1936 amounted to about \$18,400,000. There are two principal types of deposits from which gold is recovered—lodes and placers. The lodes are the mineralized mines or masses of ore in the country rock and represent material in place. The placers are deposits of sand and gravel which have been worn from the hard rocks in their general vicinity and in which the loose grains of gold or other valuable minerals have been more or less concentrated by surficial geologic processes.

From the beginning of the gold-rush days in 1898 for a period of 20 years the placer production of gold in Alaska far exceeded the lode production. Since 1919 the productions from the two sources have maintained a fairly constant ratio of about 60 percent placer and 40 percent lode. The placer mining operations are very widely distributed over the Territory with the exception of southeastern Alaska where the placers are of relatively small extent. Lode gold is recovered from widely distributed mines but the present production comes chiefly from three regions—southeastern Alaska, Willow Creek district in the vicinity of Anchorage, and the Fairbanks district. Southeastern Alaska accounts for about 75 percent of the total lode output.

The trend of placer mining in Alaska for the last few years has been toward the development of large enterprises requiring the installation of expensive equipment, such as dredges or other mechanical devices, and the mining of large but relatively low grade deposits through careful control of costs.

Such enterprises are not undertaken casually, nor can they be made productive quickly, so that in spite of the stimulation brought about by the increased price of gold there must necessarily be a considerable lag before the larger new enterprises become noteworthy producers. Small operations, which do not require such elaborate preparations, show less lag in attaining production, and consequently many small new prospecting ventures have been started, and some have made good showings. The life of the prospector has in it much that is attractive to offer to a man who enjoys the simple life, working more or less as his own boss, when, where, and how he pleases, and with the allurements of possibly discovering a real prize as a result of his efforts. Such a career obviously should be undertaken only by the physically fit and those reasonably skilled in understanding nature's secrets and the ways of acquiring what she has to offer. Many of the incidents in the life of the prospector are hard, and outstanding success comes to few in any line of endeavor; but it is believed that Alaska still holds opportunities for the capable placer prospector to find tracts that, while not bonanzas, will well repay his best endeavors. There also seems to be an increasing interest among capitalists and others in the mining development of the Territory, and doubtless, as they hold out incentives for finding workable properties, they will discover men ready and willing to undertake the quest. Anyone who remembers the difficulties of the early days and sees the present enormously better facilities and lower costs, however, has little sympathy with the laments that are often heard as to the difficulties now involved in carrying on prospecting work. It sometimes seems as if we had become so tied to automobiles, railroads, and wagon roads that we forget that the bulk of the placer gold of Alaska was produced practically without dependence on these facilities. It is known that there are still large tracts of Alaska that have not yet been thoroughly prospected or adequately examined for large-scale placer operations. Although most of these areas do not appear to give promise of holding bo-

¹ Prepared by B. Frank Heintzleman, chairman of the Alaska Planning Council, from material contained in "Mineral Industry of Alaska," Geological Survey Bulletins Nos. 880 and 897. The National Resources Committee assumes no responsibility for any recommendations in this section. They represent the views and opinions of the above-named author.

nanza deposits that can be won easily and cheaply, there are extensive areas in which, it is confidently believed, well-organized and well-managed companies will find placers that can be mined profitably for many years.

Silver.—The total silver production of the territory in 1936 was valued at \$369,000.

By far the greater part of the silver that is produced in Alaska occurs as a relatively minor constituent in ores whose principal value lies in some other metal. Nearly 70 percent of the silver that has been extracted in the past has been derived from ores chiefly valuable for their copper content. All of the gold-lode mines yield some silver. The development in Alaska of ores that are valuable principally for their silver content is necessarily attended by many more difficulties and expenses than are likely to be met in developing gold mines. Among the most obvious reasons for this difference are the much lower value per unit of weight of the silver and the fact that more elaborate and expensive processes are usually required to recover silver in a readily salable metallic state than to recover gold. As a result, it is more or less unwarranted at this time to attempt to develop or even to search for silver lodes in remote parts of Alaska unless the ore has an especially high tenor. Therefore, although silver-lead lodes have been reported at many places in interior Alaska, none of them has been very thoroughly examined or seriously considered by capitalists. It is true that several years ago some shipments of silver-lead ores were made from interior Alaska, especially from the Kantishna district, north of the Alaska Range, but although the ore was of high grade and the price of silver much higher than at present, the expense of transporting it to smelters in the States and having it smelted consumed practically all the profits. In southeastern Alaska, however, where the region is much more accessible to deep-water transportation and all operating costs are lower, there have been many attempts to find and develop silver-lead deposits. The greatest amount of work of this kind has been done in the region at the head of Portland Canal, near the international boundary. The richest deposits that have been found lie on the Canadian side of the boundary, and it is there that the famous Premier silver and gold mine is situated. The geologic conditions on the Alaska side of the boundary, in the Hyder district as it is locally called, seem to be comparable in places to those on the Canadian side, and this similarity has sustained interest in the search for profitable silver and gold deposits there. Scores of claims have been taken up and more or less prospecting and development work done. The much greater unit price of gold and its more

ready recovery have focused the search on gold lodes rather than on silver lodes, so that some of the claims that in the early days of the camp showed indications of prospective value mainly in silver and lead have been neglected. This does not mean, of course, that rich showings would necessarily be overlooked, but simply that work has not been pressed on deposits that appeared only moderately promising. In the past mines in the Hyder district had made shipments of silver ore or concentrates to smelters in the States, but in 1935, so far as the Geological Survey is informed, only one small shipment of ore, carrying considerable silver as well as other metals, was made as a test from one of the mines near Hyder and in 1936 no silver ore from this district was exported.

Copper.—The production of copper from Alaska mines in 1936 was 39,267,000 pounds, valued at \$3,720,000. Large as these amounts are, they are small compared with the production for the period 1915 to 1927 when it practically never fell to less than 50,000,000 pounds a year. In 1916 it was 119,600,000 pounds. The great bulk of the copper output of the Territory comes from the group of mines operated by the Kennicott Copper Corporation in the Copper River region. These mines have been worked actively for 25 years and if no more ore bodies are discovered, it is expected that the enterprise will close down in only a few years.

That there are other places in Alaska where copper minerals occur is well known. That some of these deposits contained enough copper to enable them to be worked at a profit under past conditions is a matter of history. It is extremely doubtful whether any of the known copper deposits that are not now being mined can be worked at a profit under present conditions. As a consequence, practically all activity at properties of this kind has been discontinued and doubtless will not be resumed until the price of copper has materially advanced. That there may be deposits, as yet unknown, which might repay development is possible, but the incentive to search for them is so small and the probability of failure so great that prospectors are not willing to take the gamble. At present, therefore, search for new copper deposits or development of those already known has practically ceased. Obviously, no forecast can be made as to when these conditions are likely to change. Various remedial or palliative measures have been proposed which might encourage the copper-mining industry, but it seems doubtful whether much improvement can be looked for in the near future. Probably the only thing that is likely to keep the production of copper from Alaska ores from declining seriously will be the more extensive mining of ores in which the copper is a byproduct

and gold or some other metal more sought after is the principal object.

Lead.—The lead produced from Alaska ores in 1936 is estimated to have been 2,116,000 pounds. Practically all of this was recovered as a byproduct from the gold ores.

Lead ores are widely known throughout the Territory, and in the past shipments valuable at least in part for their lead content have been made from many areas in southeastern Alaska, especially the Hyder district; from the Yukon-Tanana region, especially the Kantishna district; and even from far-away Seward Peninsula, at the Omalik mine, and from the Kobuk district in the vicinity of Shungnak. Lead is, however, a heavy, low-priced commodity which requires rather elaborate treatment to produce in readily salable metallic form, and these drawbacks, coupled with the low current price for the metal, act as deterrents to the development of lead deposits in remote regions. The outlook for any notable increase in the production of this metal, therefore, seems to depend on the stimulation of the mining of other metals and the consequent increase in the production of lead as a byproduct. That this increase in mining lodes of mixed metallic content is likely to take place is regarded as a certainty, and that some of the silver-lead deposits which are now lying idle will be opened up again seems almost equally certain. As general business conditions throughout the world improve, an increase in the output of lead from Alaska ores is looked for with considerable assurance.

Platinum metals.—The total quantity of metals of the platinum group produced in Alaska in 1936 was 5,654 fine ounces valued at \$241,900.

The outstanding development in the placer platinum-mining industry in Alaska, as well as anywhere in the United States proper, was in the Goodnews Bay district, in the lower Kuskokwim region, where two well-mechanized plants and several smaller outfits produced by far the larger part of the Alaska output for the year. Nearly 60 claims are now controlled by one company, and between 15 and 20 men are employed in the work. In addition to these larger companies there were several small outfits mining by ordinary open-cut and sluicing methods. Two other localities in which platinum was recovered in 1935 and 1936 were Kasaan Peninsula in southeastern Alaska and the Seward Peninsula. Places where platinum has been recognized are widespread through other parts of the Territory.

Tin.—For many years Alaska has been a small but regular producer of tin, and in the course of the more than 30 years since tin minerals were discovered on Seward Peninsula and later elsewhere in the Territory,

it has shipped tin worth more than \$1,255,000. During this period the greatest annual production was in 1916 and was equivalent to 139 tons of metallic tin. In the period between 1920 and 1935 the average yearly output has been only about 13 tons. In 1935 and 1936, however, there was a great increase in tin production, brought about mainly through a new company starting work in the vicinity of Tin City, near the extreme western tip of Seward Peninsula.

In addition to this new camp there were several smaller ones at various points in the same general region that produced small amounts of tin by ordinary open-cut methods of placer mining. A small amount of placer tin was also recovered from the gold-mining operations in the Hot Springs district of the Yukon region. At present all the Alaska tin is sent to Singapore for reduction, but doubtless if there were a constant dependable supply available, some arrangements would be made to handle it in the States.

As to the future of the tin industry in Alaska the facts at hand are not yet sufficiently definite to warrant expressing any fixed conclusions, but a visit to parts of the tin fields of western Seward Peninsula gave certain definite impressions as to the desirability of much further prospecting there. The tenor of much of the placer ground being mined runs from 20 to 30 pounds of tin ore to the cubic yard of material, which, at a price of 50 cents a pound for metallic tin and with concentrates containing about 75 percent of tin, gives a value per cubic yard that seems extremely attractive. The conditions for mining offer some drawbacks, as there are no trees in the region, so that it is extremely difficult in most places to get even enough wood to maintain a campfire; much of the bedrock is limestone, so that in few places is there enough fresh water to maintain even a meager sluicing operation; and the climate is bad and the season short. On the other hand, few parts of the prospective tin area are far from the sea, so that transportation charges are moderate and sea water might be advantageously used for many of the mechanical operations at the plant; the limestone bedrock offers good footing over much of the country and allows the construction of adequate inexpensive roads; and the use of airplanes makes the district by no means inaccessible, the flying time from Nome being only about an hour. There is also the likelihood that in the course of placer operations areas of bedrock that were sufficiently mineralized to be worked as lodes might be disclosed and thus an industry established that might be carried on uninterruptedly throughout the year, more or less regardless of weather conditions.

Coal.—The coal produced from Alaska yields in 1936 was 136,600 tons. This is the largest output that has

been afforded by Alaskan mines during the whole period that coal mining has been in progress. In addition to the local production, 39,449 tons of coal was imported in 1936 and no Alaska coal was exported. The total Alaska consumption was thus 176,049 tons. The average price of the local product was about \$4.20 per ton.

Practically all of the coal mined in 1936 came from two mines—one in the Matanuska field and another in the Nenana or Healy River field. A large part of the production of the former was sold to the Alaska Railroad for locomotive and power fuel, but many orders for domestic use in the railroad belt were also filled. The largest single user of coal from the Healy River mine is a large gold dredging concern in the Fairbanks district but a considerable power and domestic market for the product is being built up in interior Alaska.

In the Bering River field, where extensive deposits ranging in composition from bituminous coal to anthracite have long been known, prospecting or other development work relating to the coal resources continued to be at a standstill in 1936. Rumors of renewed activity in this field were heard from time to time, and extensions of some of the Government permits for coal prospecting there have been asked for, as the old permits were near their expiration. It is evident that this field has much potential value, but it is also evident that the present coal consumption of Alaska is not such as to stimulate large companies to undertake extensive projects and that until there is a greater demand for their product or until they are prepared to invade a more distant market, where competition will be more severe, they will not enter this field. Furthermore, the development work already done in this field indicates that some complex geologic conditions will be encountered, so that desultory prospecting by small, poorly financed, or technically unskilled operators holds little promise of success, and full development must await a company that is able to go into the matter in a large way and to bear the necessarily uncertain expense of exploring a new field.

The whole problem of the development of Alaska's coal resources is exceedingly complex, for while there are in the Territory large areas occupied by coal-bearing rocks, the local demands are fairly well supplied by existing mines, and to attempt to enter a larger field would require large outlays for developing mines and the market. Obviously, many consumers are unwilling to commit themselves to any specific agreements to purchase until they are sure that the coal offered them is available at a satisfactory price, and the mining operator, of course, in the initial stages can offer little definite assurance as to costs and availability of his product until he has some certainty as to

his market. Certainly many of the steps that must be taken, if any extensive use of Alaska coal is to be made, require that the enterprise be undertaken on such a scale as will justify the outlay for the essential facilities. This means that a considerable tonnage must be marketed, but the attempt to dispose of a large tonnage of Alaska coal will bring it into competition with coals from other areas and in places where the competitive conditions appear to be almost insuperable for the Alaska product. Many of the competitive conditions are changing, however, so that the situation must be subjected to constant review. Of course, as Alaska develops and becomes more settled, its people and industries will call for more and more coal, and in meeting this demand Alaska coals will have great competitive advantage over those from outside sources. That growth, however, probably will be relatively slow but none the less sure.

Petroleum.—No petroleum was produced from any Alaska deposits in 1936. For a number of years there has been a small but significant production of petroleum from wells of the Chilkat Oil Co. in the Katalla district, on the coast east of the mouth of the Copper River. According to the published report of this company the boiler house and contents at the refinery were destroyed by fire late in December 1933, and it has not yet been considered desirable to replace the building and equipment, because the outlook was not encouraging for the profitable operation of the property. Until such time as this refinery equipment is replaced there will be no production from the property. The wells from which the company obtained its oil were relatively shallow, few of them being more than 1,000 feet deep and none of them more than 2,000 feet. Even when the Chilkat Oil Co.'s property is in operation the small domestic production of petroleum from the Katalla field is not adequate to supply local needs, and the demand for large quantities of petroleum products throughout the Territory is met principally by imports from the continental United States. Search for new oil fields in Alaska, which had been active a few years before, had practically been discontinued by 1936, and in that year, so far as reported to the Geological Survey, only one company was drilling in the entire Territory. This was the Iniskin Drilling Co., which was testing its holdings in the Iniskin-Chinitna district, on the west coast of Cook Inlet, in the Alaska Peninsula region.

Miscellaneous mineral products.—The list of minerals of value that have been found in Alaska is long. In addition to those described in the preceding sections of this report, others which have at one time or another been produced in quantities large enough to have more than local significance and some of which

have been the basis of profitable mining industries include, among metallic products, antimony, arsenic, bismuth, chromium, iron, manganese, mercury or quicksilver, molybdenum, nickel, tungsten, and zinc; and among nonmetallic products, asbestos, barite, building stone, clay, garnet, graphite, gypsum, jade, limestone, marble, and sulphur. Without doubt small quantities of practically all these materials were "produced" in 1936 in the broadest sense of that word, but few of them were reported to have been produced and sold in quantities that represent a value of more than a few hundred dollars and so far as could be determined the total value of the production in 1936, of all the mineral products not described in the earlier part of this report, was practically \$52,000.

One of the hitherto large mining enterprises is the quarrying of marble by the Vermont Marble Co. from its properties near Tokcen and Calder, in southeastern Alaska. No productive mining was done there during 1935, but in 1936 quarrying was resumed to supply the needed raw material for the company's finishing plants near Seattle and San Francisco. The general practice of this company has been to operate these quarries actively at intervals and supply all the stone it needed for the ensuing 2 or 3 years, during which time the quarries are kept only in a stand-by condition. The stone from these quarries is used in most of the larger and better buildings in the whole Pacific coast region, being especially in demand for interior trim and decoration. There is, of course, no basis for believing that the cessation of quarrying during any one year means the permanent closing of the property. It only marks a halt in production until sales of the product now on hand deplete the stock so that replacements are needed, and there is every indication that this will occur shortly so that the quarries will again be running. Limestone and marble are widely distributed throughout southeastern Alaska, and many different grades, some even approaching statuary quality, are found in the region. It therefore seems certain that some of these limestone and marble deposits, many of which are favorably situated with respect to deep-water transportation, will ultimately be profitably developed.

The quarrying of limestone as an ingredient of cement afforded much the larger part of the amount credited here to miscellaneous minerals in 1935 and 1936. The quarries at which this high-grade limestone is mined are on Dall Island, in the Ketchikan district of southeastern Alaska. From the quarries at this locality the rough stone is shipped in barges to Seattle, where it is treated and mixed with the other constituents of the cement. This property has been productive for several years.

Cinnabar, the principal ore of quicksilver, has been recognized in the placer concentrates from streams in many parts of the Territory, but in most of these places the lodes from which it came were apparently small stringers that appear little likely to afford ore that can be mined under present conditions. In the central and western parts of the Kuskokwim Valley there are, however, extensive areas of cinnabar mineralization which have long been known and which appear to hold promise of containing quicksilver deposits that may be profitably developed, though much further exploration will be required to determine their real value. The place in this region where the greatest amount of development work has been done is on property about 10 miles in an air line downstream from the junction of the Holitna with the Kuskokwim. During 1935 arrangements were made for extensive prospecting of the property by a well-qualified mining engineer and small crew, with a view to putting it into production if the tests proved satisfactory. The successful opening up of a commercial field in this part of Alaska would have much significance not only in its direct returns but indirectly, as establishing a new center from which development of all kinds might be extended into the little-known areas of the Kuskokwim Valley, and therefore developments at this place will be watched with especially keen interest. In Seward Peninsula, near Bluff, quicksilver ore has long been recognized, and some development work has been done on it. In 1935 a little ore was mined here but not retorted or otherwise disposed of.

Antimony ores are widely distributed throughout Alaska, and in the past considerable quantities were produced and shipped from the Territory. Many of the lodes of the other minerals, notably gold, contain considerable stibnite, the sulphide of antimony, and in the course of mining them some antimony is necessarily taken out, though most of it is lost in the tailings. At a few mines, as in the Fairbanks district, some of the larger masses of stibnite are laid aside until enough has accumulated to be worth shipping. Late in 1936 activity in the mining of an ore in the Kantishna district in which antimony is the principal constituent revived interest in the production of this metal. This work was done at the Stampede claims in the northern foothills of the Alaska Range, near the northern boundary of Mount McKinley Park. The occurrence of a large mass of stibnite ore at this place has long been known, but no extensive attempt has previously been made to undertake mining there, so that the progress of the work will be watched with keen interest, as the success of the venture would mean much, not only in itself, but also in the general development of the whole Kantishna district.

Prospecting is said to have been continued on the known nickeliferous sulphides of Chichagof and Admiralty Islands, in the northwestern part of southeastern Alaska, but no ore is reported to have been produced for sale during the year. Some excitement was caused by the reported find of extensive nickel-bearing deposits in the Goodpaster Valley, east of Fairbanks. Samples from this area contained nickeliferous minerals but they are not abundant enough to be regarded as constituting an ore, especially when occurring in so remote an area as the one in question. The find is significant, however, in showing the presence of nickel in the region, and further prospecting seems well warranted to see whether richer deposits may be found. The desirability from both a commercial and a national standpoint of developing a domestic source of nickel is obvious, and encouragement should be given to determine more fully the resources of any areas in Alaska that are known to contain nickel-bearing minerals.

Outside of a small amount of prospecting and assessment work, no productive mining is reported to have been in progress at any of the chrome-ore deposits in the southern part of Kenai Peninsula, where ores of this sort have long been known and at times have been marketed. In the vicinity of Red Mountain especially large bodies of chrome ore have been known for some time, but what average chrome content can be maintained under commercial conditions, what will be the cost of mining it and transporting it to the market, and what profit will be left after it is sold are matters that still require investigation. According to newspaper accounts some prospecting for chromite ore was carried on during 1935 near Red Bluff Bay, Baranof Island, in southeastern Alaska, and a number of claims staked there. Samples from these claims are

said to have carried from about 40 to 52 percent Cr_2O_3 . No details regarding the developments, future plans, or specific ownership of these claims have been received by the Geological Survey.

Little new development of the many kinds of non-metallic mineral products that occur in Alaska took place during 1936. Articles of incorporation have been filed with the Territorial officials by a gypsum company. The company states that it proposes to develop gypsum deposits throughout the Territory, but evidently it will be concerned chiefly with areas near the known deposits in southeastern Alaska. Reports have long been current of attempts to develop the sulphur deposits that are known to occur in the craters of some of the volcanoes of the Aleutian Islands and nearby portions of the Alaska Peninsula. According to newspaper reports a newly organized company has acquired extensive holdings on Akun Island, which it proposes to develop in connection with certain sulphur properties it owns in the State of Washington, to supply sulphur to the paper-pulp mills in the Pacific Northwest. The accounts stated that the company expected to have the property in operation before the end of the year, but so far as known this expectation was not fulfilled.

Although the various mineral commodities here grouped under the heading "miscellaneous mineral products" yielded negligible monetary returns in 1935 and in 1936, yet their diversity, their wide distribution, and the interest that is being displayed in the search for them indicate that they already play an important part in the mineral economies of the Territory and are destined to become even more significant as the development of Alaska proceeds.

APPENDIX B

COMMENTS ON THE REPORT ON ALASKA'S RECREATIONAL RESOURCES AND FACILITIES

By ROBERT MARSHALL, U. S. Forest Service

The basic philosophy of Alaska recreational planning should be to make Alaska recreation fit into the whole picture of United States recreation so that there will be a reasonable balance in the types of outdoor enjoyment obtainable on United States lands. It should not be development, the greatest possible returns or increasing the volume of tourist traffic.

The opportunity of coordinating Alaska recreational development with a reasonable national program is peculiarly possible because Alaska contains only 59,000 inhabitants who already have a standard of living well above the average in the continental United States. Therefore, it is not necessary, in planning the use of Alaska resources, to work primarily for increased local income. Furthermore, increased recreational use would not materially improve the economic status of more than that minor fraction of Alaskans who own hotels, resorts, stores, or real estate, or who have a flair for speculation or promotion.

When Alaska recreation is viewed from a national standpoint, it becomes at once obvious that its highest value lies in the pioneer conditions yet prevailing throughout most of the territory. These pioneer values have been largely destroyed in the continental United States. In Alaska alone can the emotional values of the frontier be preserved.

Because the unique recreational value of Alaska lies in its frontier character, it would seem desirable to establish a really sizable area, free from roads and industries, where frontier conditions will be preserved. Fortunately, this is peculiarly possible in northern Alaska for economic and social reasons as well as recreational ones. Economically, the population is so scattered that airplane transportation is the only feasible means of mechanical conveyance, and auto roads could not possibly justify their great cost. At the same time, the country is far too remote from markets for successful industry. Sociologically, the country of northern Alaska is inhabited chiefly by native populations which would be much happier, if United States experience is any criterion, without either roads or industries. Therefore, I would like to recommend that all of Alaska north of the Yukon River, with the exception of a small area immediately adjacent to Nome, should be zoned as a region where the Federal Government will contribute no funds for road building and permit no leases for industrial development.

Alaska is unique among all recreational areas belonging to the United States because Alaska is yet largely a wilderness. In the name of a balanced use of American resources, let's keep Alaska largely a wilderness!

